The Architect of Theory

Vitruvius and the Intellectual World of Roman Antiquity

The most influential surviving architectural theorist of Roman antiquity

Diego Kurilo

Sophia Lux Publishing House

Autonomous City of Buenos Aires, 2026

Franklin 2054, Buenos Aires (CABA), Argentina — Tel: 011 4584-7071

First English edition, 2026 · Editorial revision V297

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Published in Buenos Aires, Argentina.

Typeset in EB Garamond. Printed and bound on demand.

Abstract

Abstract. This Latin–English reading and reference edition presents Vitruvius's De architectura with translation, notes, and historical and architectural commentary. The English derives from Diego Kurilo's authorial Spanish translation; the Latin is checked against Krohn (1912). Documentary testimony, editorial reconstruction, architectural explanation, and the author's hermeneutic proposals are distinguished. The editorial principles define the scope of the selective apparatus. References follow the Chicago Manual of Style, 18th edition (2024), with American English spelling.

Keywords. Vitruvius; De architectura; Roman architecture; architectural theory; bilingual critical edition; Latin philology; history of architecture; proportion; symmetria; Vitruvian Man.

To all those who have contributed to preserving the knowledge of Antiquity

"Architecti est scientia pluribus disciplinis et variis eruditionibus ornata." — Vitruvius, De architectura 1.1.1

In his Autobiography, Jorge Luis Borges stated that, "if I had to point out the most important event of my life, I would say my father's library."

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Concordance and system of reference. — All the editions listed above transmit the same canonical division of the De architectura into ten books, each subdivided into chapters and numbered sections (the prefaces being cited as praef.). This division, fixed since Rose and universally adopted thereafter, serves as the

concordance between editions: any passage cited in the present edition by book, chapter and section in Arabic numerals (e.g., 3.1.3; 7.praef.11) may be located directly in Rose, Krohn, Granger, Fensterbusch, the Budé (Gros–Callebat–Soubiran) and Rowland–Howe, since all cite by the same numbers. The editions differ only in pagination and, occasionally, in the placing of a section-break or the internal subdivision of a long section (the Budé subdividing more finely than Rose); such divergences, where they bear on a citation, are noted in the apparatus. No separate page-concordance is therefore required: the numeral itself is the concordance.

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None of the plates derives from Vitruvius's own illustrations, which do not survive as an identifiable authorial set: every figure reproduced here is a later reconstruction, interpretation or work of art inspired by the treatise.

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The Vitruvian Man

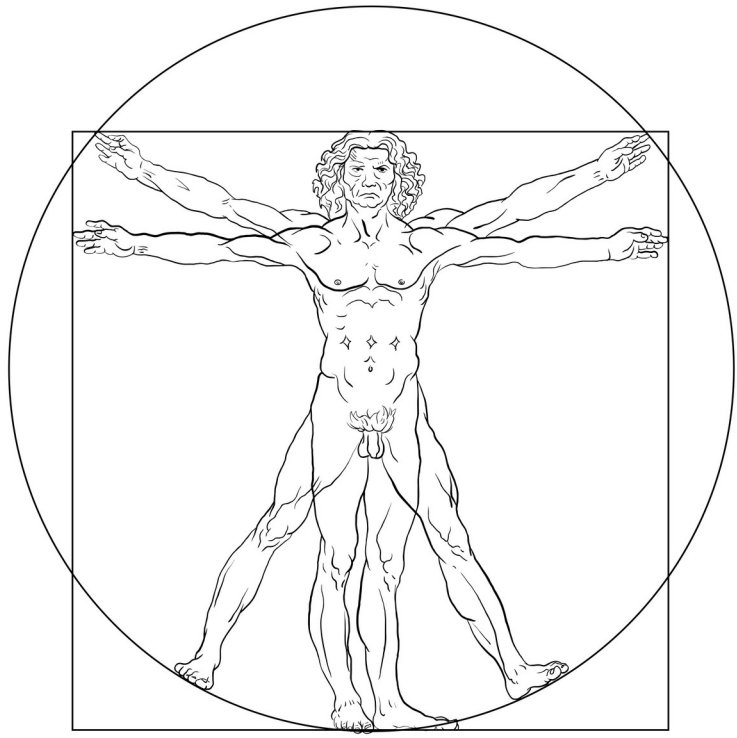


Figure 1. Modern line rendering after Leonardo da Vinci, Vitruvian Man, c. 1490. Historical original: Gallerie dell'Accademia, Venice, Gabinetto dei Disegni e delle Stampe, inv. 228r. Vector source: Wikimedia Commons, Da Vinci Vitruve Luc Viatour 2.svg; public domain.

Leonardo's Vitruvian Man, c. 1490, is an individual drawing preserved in the Gabinetto dei Disegni e delle Stampe of the Gallerie dell'Accademia, Venice, inv. 228r. The modern line rendering reproduced here derives from that sheet and illustrates the relationship between bodily measure and geometric construction.

The Geometric Dilemma

Leonardo's drawing is, in essence, an exercise in proportional reconciliation rather than an attempt to solve the squaring of the circle. In Book III of De architectura, Vitruvius had proposed that the human body could be inscribed

within both a square and a circle. Mathematically, however, this posed a difficulty: the squaring of the circle is impossible by means of elementary Euclidean geometry.

Through his drawing, Leonardo proposed a graphical interpretation of Vitruvius's description:

- **The square** represents the earthly realm—stability and the human measure derived from height, since the span of the outstretched arms equals the height of the body. Its center lies at the groin.
- Leonardo places the center of the circle at the navel and that of the square at the groin. These distinct centers allow him to reconcile the figures graphically. The construction does not provide a geometrical solution to squaring the circle. In the interpretation proposed here, the body mediates between the stability of the square and the cosmic associations of the circle.

2. Anatomical and Technical Characteristics

Leonardo did not base this drawing on Vitruvius's text alone; he enriched it with his own anatomical research:

- **Proportion and modularity. The drawing reflects Leonardo's preoccupation with the module. He divides the body into sections governed by the head (approximately one-eighth of the total height) and the hand (approximately one-tenth), confirming the Vitruvian measurements through dissection and the study of proportion in living men.**
- **Canon and mechanism. The superimposition of two poses—arms outstretched horizontally and raised in a V-shape—presents the body at once as a static canon and as a dynamic mechanism. The lines serve not as decoration but as axes of symmetry and proportional guides.**

3. Philosophical and Symbolic Interpretations

Leonardo's drawing may be read as a link between earthly and cosmic orders. The square, centered at the groin, suggests material stability and human measure. The circle, centered at the navel, suggests perfection and the celestial realm. These symbolic associations belong to the interpretation proposed here.

- This reading aligns with the Neoplatonic and Pythagorean tradition, widely diffused in Renaissance intellectual circles, according to which a

correspondence was held to obtain between the microcosm (man) and the macrocosm (the universe).

- Such symbolic interpretations, however culturally significant, represent a later interpretive layer rather than a direct reconstruction of Vitruvius's own intentions, which were proportional and technical.
- In the author's own interpretive proposal, Leonardo's graphic solution — the shifting of the two centers — constitutes not merely an anatomical study but a visual meditation on the tension between ideal geometry and embodied reality.

4. A Critical Reading: Art or Science?

In scholarly terms, the drawing must be classified as a document of technical research. Through the precision of his line, Leonardo transforms an ancient theoretical text into a manual of practical application. Where Vitruvius had proposed the body as a norm—a rule to be followed—Leonardo presents it as evidence: something that can be measured, tested, and observed.

The *Vitruvian Man* should be read as a visual exegesis of the classical canon, in which the anatomical figure functions as a system of coordinates. Leonardo does not merely illustrate Vitruvian theory; he submits it to empirical verification, employing geometry as the language through which the human subject is integrated into the cosmic order. The superimposition of the two figures, far from being a mere aesthetic device, constitutes a study of the body's operation in space, and it reaffirms the architect's role as the agent charged with harmonizing the laws of nature with the construction of the human habitat.

Preliminary Note: Scope and Methodology

Purpose and audience. The central aim of this edition is to offer English-speaking readers—and architects, architecture students, and art historians in particular—a complete bilingual Latin–English edition of Vitruvius's Ten Books, accompanied by a study that gathers and orders the treatise's architectural doctrine together with the anecdotes that illustrate it. It is not conceived as a new recension of the Latin text—which is drawn from the established critical editions (Krohn 1912, checked against Rose 1899 and the Budé edition)—but rather as a means of presenting the English translation derived from the author's original Spanish version, checked against the Latin where necessary and annotated, within reach of the professional and the scholar, for whom, to the best of our knowledge, a complete and accessible bilingual version of this kind has not hitherto existed. Alongside this philological and pedagogical purpose, a separate and clearly distinguished section sets out a personal interpretive proposal.

On the place of this edition within the publishing tradition: it is important to situate this edition honestly within the tradition of Vitruvian editions, so as to make clear what it contributes and what it does not claim to be. The definitive critical edition remains that of the Collection des Universités de France (the "Budé," Les Belles Lettres, 1969–2009), directed by Pierre Gros and prepared by Louis Callebat, Jean Soubiran, Philippe Fleury, and other specialists: it establishes the Latin text from the manuscripts, book by book, with a critical apparatus and a monographic commentary. Anyone seeking a definitive textual constitution of Vitruvius should turn to it.

Kr. abbreviation of Krohn in the apparatus.

Bud. abbreviation of the Budé edition in the apparatus.

Gr. abbreviation of Granger in the apparatus.

edd. recent. *editiones recentiores*: the later (Renaissance and modern) editions, as opposed to the manuscripts.

In the bilingual sphere, Frank Granger's Loeb edition (Harvard University Press, 1931–1934) presents the Latin and English on facing pages, based on the Harleianus 2767; its usefulness is undeniable, even if its translation and notes have aged. In English, the version by Ingrid D. Rowland and Thomas Noble

Howe (Cambridge University Press, 1999) is today the standard, with a sound commentary and Howe's technical reconstructions, although it does not reproduce the Latin on facing pages. In Italian, the edition by Antonio Corso and Elisa Romano, under the direction of Gros (Einaudi, 1997), is notable for the breadth of its commentary.

Complete bilingual editions — presenting the Latin alongside a fluent modern translation for reading and reference — remain comparatively few. In Spanish, for instance, the available versions are translations rather than complete bilingual editions. The most widely circulated—that of José Luis Oliver Domingo, with an introduction by Delfín Rodríguez Ruiz (Alianza, 1995)—is a Castilian version without the Latin text; Francisco Manzanero's translation for Gredos covers only the first five books; and the historic translation by José Ortiz y Sanz (1787), of great value, is likewise monolingual and now linguistically remote. To the best of our knowledge, no complete Latin–English bilingual edition of all ten books, designed specifically for the architect-reader and uniting critical apparatus with architectural analysis, yet exists.

It is precisely this gap that the present edition aspires to fill. It is offered, therefore, not as a new critical edition—a domain in which the Budé remains unsurpassed—but as a bilingual edition for reading and reference: it reproduces the Latin text already established by philology (Krohn 1912, checked against Rose 1899 and the Budé edition), accompanies it with an English translation derived from the author's original Spanish version and an apparatus of notes, analytical indexes, and indexes of Greek words, places, and names, and places it at the service of the English-speaking architect, student, and historian. Its ambition is not to rival French textual criticism, but to place at the service of the English-speaking reader—as a contribution from the Hispanic scholarly tradition—a bilingual reference edition that unites an up-to-date philological apparatus with the architect's technical and symbolic analysis.

This work seeks to explore the intersection between the architectural practice of classical antiquity and the systems of meaning that shaped its symbolic world. To that end, it is essential to set out the methodological framework underpinning the study, so that the reader may clearly grasp the nature of the materials presented. The method operates on two distinct levels.

This work therefore proceeds on two distinct but complementary levels, which are kept apart throughout: historically verifiable data and technical analysis on the one hand, and interpretive proposals of a more speculative nature on the other.

The first level adheres to the canons of architectural historiography and classical philology, drawing on material evidence, epigraphy, and textual sources—such as Vitruvius's *De architectura* or the writings of Pliny the Elder—to reconstruct the techniques of layout and setting-out and the roles of the building professions in the Greco-Roman world. Here documentary rigor governs throughout, subordinating the analysis to archaeological verification and established scholarly consensus.

The second level is hermeneutical, addressing the symbolic and cultural dimensions of architectural form. The readings it proposes — of sacred space and of numerical iconography — are offered expressly as the author's interpretive contribution, clearly signalled as such, and are not presented as a substitute for the philological and archaeological consensus.

The author is fully aware that such approaches, in proposing semantic links beyond archaeological literalism, belong to the realm of scholarly speculation. Every effort has therefore been made to separate historical data precisely from symbolic inference, leaving the reader to judge the validity of these correlations. Ultimately, the work aspires not to a single, definitive truth but to the opening of an interdisciplinary dialogue between the precision of constructional data and the depth of symbolic thought in antiquity.

Cesare Cesariano: Reconstruction of the Basilica of Fano after Vitruvius, 1521, detail: elevation.

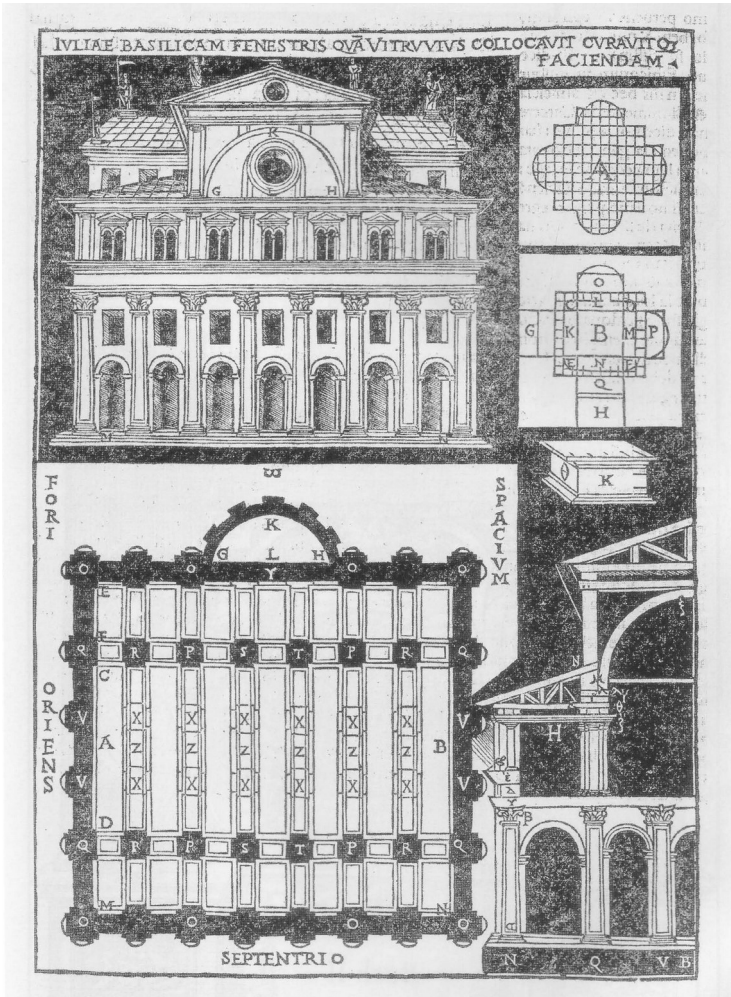


Figure 2. Cesare Cesariano, reconstruction of the basilica at Fano, in Di Lucio Vitruvio Pollione de architectura libri dece (Como, 1521), Book V. Historical printed illustration, reproduced through Wikimedia Commons; a Renaissance interpretation of Vitruvius 5.1.6–10.

In Book V of *De architectura*, after providing information on the minimum and maximum proportions of basilicas, namely 3:1 and 2:1 between length and width, Vitruvius offers a description of the basilica of Fano, a more modern model in which the author was directly responsible for its construction (*"conlocavi curavique faciendam"*). As emphasized in the edition of Vitruvius by Pierre Gros, this basilica is the only building that Vitruvius explicitly claims as his own work.

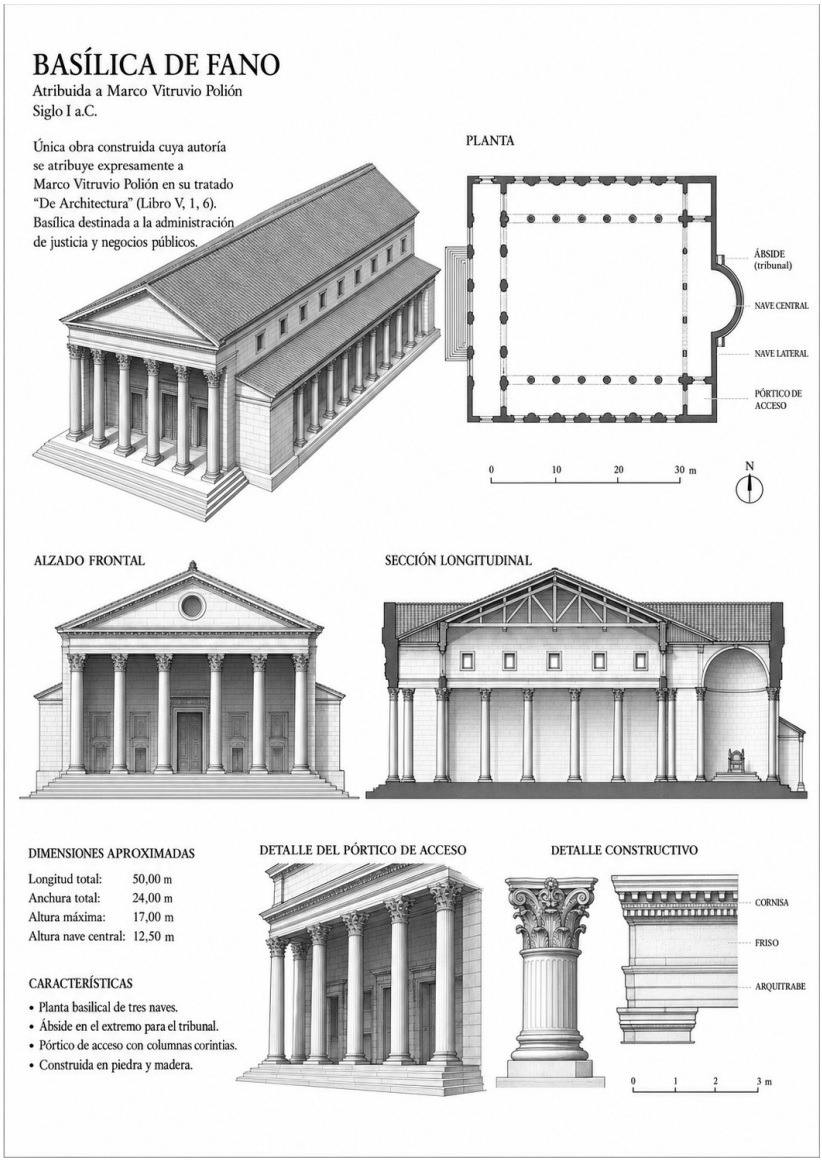


Figure 3. The basilica of Fano: modern interpretive reconstruction, supplied for this edition (2026), after Vitruvius 5.1.6–10. The plate combines a perspective view, plan, elevation, section and constructional details. It is not an ancient illustration or a survey of the remains identified in 2026.

Introduction

This book centers on the figure of Marcus Vitruvius Pollio, the most influential surviving architectural theorist of antiquity.

De architectura is by no means confined to technical matters. Clearly inspired by Hellenism, and with explicit references to inventors such as Ctesibius, the treatise treats, in encyclopedic fashion, the architectural orders, building materials, decorative techniques, building types, hydraulics, the use of color, gnomonics (Book IX), and both civil and military machinery (Book X). Vitruvius describes, for instance, the workings of the water-wheel and of various lifting and siege engines, displaying an exceptional command of the engineering of his day.

The influence of *De architectura* has endured across the centuries. First printed in Rome in 1486 by the humanist Giovanni Sulpicio da Veroli, the treatise became one of the foundational texts of the Renaissance. Petrarch was a major force behind its rediscovery, and its influence reached figures such as Leon Battista Alberti, Andrea Palladio, and Leonardo da Vinci, who based his celebrated Vitruvian Man on the human proportions described in the treatise.

For Vitruvius, the ideal architect had to command a broad range of knowledge: writing, drawing, geometry, arithmetic, history, philosophy, music, medicine, law, and astronomy. Only through this comprehensive formation—which he called encyclios disciplina [encyclopedic education; cf. Vitruvius, De architectura 1.1.12]—could one attain the summum templum architecturae [the summit of the art of architecture; cf. Vitruvius, De architectura 1.1.11], the highest peak of the discipline.

This book seeks to present both the historical and technical dimensions of Vitruvius and the rich symbolic readings his work has prompted over time. The historical and philological sections rest on primary sources and specialized critical literature; the hermeneutic and interpretive sections, clearly identified as such, set out the author's proposals on Pythagorean symbolism and the architectural traditions of antiquity. The aim, ultimately, is a comprehensive approach to one of the most influential thinkers in Western culture.

The Six Fundamental Principles of Architecture

In Book I of his treatise (*De architectura* 1.2.1), Vitruvius holds that architecture is composed of six essential principles (*principia*), which form the theoretical foundation of the entire discipline. These six concepts are not isolated elements; they operate in an interdependent, organic way, articulating the technical, aesthetic, and ethical dimensions of building.

1. The Vitruvian triad: *firmitas*, *utilitas*, and *venustas*

Before setting out the six principles, Vitruvius affirms that every building must satisfy three fundamental conditions (*De architectura* 1.3.2):

- ***Firmitas*** (solidity): structural stability and the durability of materials.
- ***Utilitas*** (utility): functionality and fitness for the intended use.
- ***Venustas*** (beauty): aesthetic grace and visual harmony.

These three requirements form the basic triad of architecture and must be met simultaneously for a work to be deemed accomplished.

The Six Operative Principles (principia)

On this basis, Vitruvius defines six technical and aesthetic concepts by which the three foregoing requirements are achieved:

Principle	Greek Term	Core Meaning	Domain
Ordinatio	τάξις (taxis)	Modular ordering according to a common unit	Quantitative and Modular
Dispositio	διάθεσις (diathesis)	Arrangement; the conception and graphic representation of the design	Intellectual / Project-based
Eurythmia	εὐρυθμία (*eurythmia*)	Visual harmony and graceful proportion as perceived by the eye	Aesthetic
Symmetria	συμμετρία (*symmetria*)	Commensurability: the proportional relationship of the parts to the whole and to a common module	Mathematical
Decor	τὸ πρέπον (to prepon)	Propriety, appropriateness and contextual fitness	
Distributio	οἰκονομία (oikonomia)	Economic and functional distribution of resources	Practical / Ethical

Note. τὸ πρέπον provides a conceptual comparison for decor. At I.2.5, θεματισμός concerns statio, a ritual or institutional prescription; it is not a direct Greek equivalent of decor or a seventh principle.

Table 1. *The six operative principles of architecture*

Note. The Greek equivalents follow the Budé edition (Pierre Gros et al.). The term *decor* corresponds to τὸ πρέπον (that which is fitting), a concept central to Vitruvian aesthetics and ethics. The Greek word θεματισμός that appears at 1.2.5 properly renders *statio* —ritual or institutional rule—, one of the three modes by which *decor* is achieved (together with custom and nature), and not *decor* itself.

2.1. *Ordinatio* (τάξις) – Ordering

It is the correct disposition of the members of the work according to a common unit of measure (*modulus* or *rata pars*). It constitutes the quantitative, modular aspect of architecture.

2.2. *Dispositio* (διάθεσις) – Disposition

It consists in the intellectual conception of the building and its graphic representation, expressed through three modes of representation:

- Ichnographia (the plan)
- Orthographia (the elevation)
- Scaenographia (the perspective view)

It is the creative, design moment par excellence.

2.3. *Eurythmia* (εὐρυθμία) – Eurythmy

It is the pleasing, harmonious appearance that arises from the correct application of proportion. It is not mere mathematical proportion, but the agreeable visual effect that proportion produces.

2.4. *Symmetria* (συμμετρία) – *Symmetria* / Commensurability

It does not denote modern bilateral symmetry, but the **proportional correspondence** between the parts and the whole, established from a common measure (*rata pars*). It is the mathematical, rational principle par excellence.

2.5. *Decor* (*decor*) – Decorum / Propriety

The aesthetic, functional, and cultural appropriateness of the work. Vitruvius distinguishes three kinds:

- by convention (*statio*);
- by custom (*consuetudo*);

- by nature (*natura*).

It governs, among other things, the choice of architectural order according to the divinity or the function of the building.

2.6. *Distributio* (οἰκονομία) – Distribution / Economy

It is the sound management of material, financial, and spatial resources. It comprises the rational distribution of spaces according to use and social standing, as well as the prudent control of costs.

Scholarly Note

These six principles form a coherent, hierarchical system. While *ordinatio*, *symmetria*, and *eurythmia* concern quantitative and aesthetic relationships, *dispositio* and *decor* address the qualitative and intellectual dimension, and *distributio* introduces the practical and ethical dimension of architecture. Their formulation has exerted an extraordinary influence, from the Renaissance (Alberti, Palladio) to contemporary architectural theory.

"Theories that attribute a sacred or esoteric meaning to the number 216 should be treated with caution. While Vitruvius clearly valued Pythagorean proportions, such speculative interpretations exceed the strictly technical and geometric framework of his text. Scholarly analysis ought to be confined to the technical and geometric function of the number in building practice, thereby avoiding any slide towards interpretations that lack empirical support."

References

Vitruvius, De architectura 1.2.1-9.

Rowland, Ingrid D. and Thomas Noble Howe, *Vitruvius: Ten Books on Architecture* (Cambridge: Cambridge University Press, 1999), 25 –28.

Krohn, F., Vitruvii De architectura libri decem (Leipzig: Teubner, 1912), 13–15.

Vitruvius: Life and Work

The name of Vitruvius

The name by which tradition knows the author —*Marcus Vitruvius Pollio*— follows the tripartite structure of the Roman name: *praenomen*, *nomen*, and *cognomen*. Of the three elements, only the *nomen Vitruvius* is securely attested by the treatise itself; the *praenomen Marcus* and the *cognomen Pollio* derive from later sources and are accepted with reservations.

The *praenomen Marcus*, one of the commonest at Rome, is usually connected with the god *Mars*; its attribution to Vitruvius rests on the medieval manuscript tradition rather than on any direct ancient testimony. The *nomen Vitruvius* denotes the *gens* or family line and is of uncertain Italic origin: it has been linked to *vitrum* (glass, or the dyer's plant woad), which would suggest a remote occupational origin, but the etymology is not secure. It is, in any case, the only component of the name the author himself confirms.

The cognomen Pollio —from pollere, "to be strong or influential"— is first associated with Vitruvius in the epitome of Marcus Cetius Faventinus (s. III–IV AD). Hence some scholars have read the phrase "Vitruvius Pollio" not as a single name but as the juxtaposition of two authors —Vitruvius and (Asinius) Pollio—; the hypothesis, however, lacks firm proof. The coincidence with Gaius Asinius Pollio (76 BCE – AD 4), orator, historian, and founder of the first public library at Rome, has fed speculation; yet nothing in the ancient sources indicates that the architect took the cognomen through any connection with him. It is safest to understand Pollio as an ordinary Latin family name, without honorific connotation.

It should be remembered, finally, that "Vitruvius" is not a surname in the modern sense but the *nomen* of the *gens Vitruvia*: the inscriptions bearing *Vitruvius* or *Vitruvia* (collected in the *CIL* and in epigraphic databases such as the EDR) belong to other members of the line, not to the architect, whose tomb and personal circumstances remain unknown.

According to tradition, Vitruvius served as a military engineer under Julius Caesar, most likely during the Gallic Wars (c. 58–51 BCE). After retiring from military service, he dedicated himself to civil architecture and engineering. During this period, he built the only building he explicitly claims as his own

work, the Basilica of Fanum Fortunae (modern-day Fano, in the Marche region of Italy), described in detail in De architectura 5.1.6–10. However, his most enduring legacy is the treatise De architectura, the only comprehensive theoretical compendium on architecture and engineering that has survived from classical antiquity. The treatise, composed of ten books with an encyclopedic structure, was probably written between 27 and 23 BCE, during the reign of Augustus.[1]

Vitruvius was inspired by Hellenistic theorists to create his work, in which he makes explicit reference to the inventions of Ctesibius. "De architectura" addresses a wide range of topics, including architectural orders, materials, decorative techniques, construction, building typologies, hydraulics, colors, mechanics, and gnomonics (dealing with gnomonics in detail in Book IX).[23]

Tatarkiewicz affirms that Vitruvius is "extraordinarily representative of Hellenism and its interpretations of this art." Moreover, he points out that "the ideas he employs [...] were typical of late Hellenism" and that he may have been inspired by the works and writings of Hermogenes of Alabanda, a 2nd-century BC architect in Asia Minor, to whom "he owes most of his opinions." 59 For Cervera Vera, Vitruvius is the first interpreter of Hellenistic architecture. Calatrava points out that "he is the great codifier of post-and-lintel architecture, of Hellenic tradition, embodied in the ideal image of the Greek temple."

1The basilica described by Vitruvius at Fanum Fortunae (Fano) must be distinguished from other Augustan basilicas excavated in Italy. Fanum denotes a consecrated place or sanctuary; fanaticus originally describes a person inspired by, or associated with, a sanctuary, before acquiring later pejorative senses. Profanus is formed from pro and fanum and denotes what lies before or outside the consecrated space; hence 'profane'.

2Ctesibius (Greek Κτησίβιος, Ktēsibios), active in the third century BCE, was an inventor and hydraulic and mechanical engineer associated with Alexandria. The ancient tradition credits him with important work on pneumatics, water pumps and improvements to the clepsydra. His investigations of compressed air and hydraulic devices hold a prominent place in the history of Hellenistic mechanics.

3Gnomonics is the art and science of constructing and interpreting sundials. The term derives from Greek γνώμων (gnōmōn), which can denote an instrument or rod whose shadow allows a direction or a measure of time to be determined.

Luis Moya warns that " the Ten Books are completely foreign to the Roman architecture of their time, " as it is quite " faithful to Hellenic and Hellenistic architecture, strictly post-and-lintel. "

Moreover, he points out that the concept of *symmetria* used by Vitruvius is of Greek origin, since, quoting Hans Plessner, he tells us that this concept " only in the hands of the Greeks grew, to become an instrument of the artists, to guarantee total harmony and make it an expression of the eternal. "

García Sánchez, Rafael. "Greek and Platonic Conceptual Influences in the Vitruvian Treatise."

Zanker, Paul. *The Power of Images in the Age of Augustus*. Ann Arbor: University of Michigan Press, 1988.

Tatarkiewicz, 2011, p. 280.
Tatarkiewicz, 2011, p. 297.
Cervera Vera, 1982, pp. 151–194.
Calatrava, 2000, p. 20.
Arnau, 1987, p. 36.
Plessner's quote in Moya, 1981, p. 117.

Vitruvius includes ten areas of knowledge that an architect should be familiar with for the benefit of their architectural work: 1. Writing, 2. Drawing, 3. Geometry, 4. Arithmetic, 5. History, 6. Philosophy, 7. Music, 8. Medicine, 9. Law, and 10. Astronomy. In his work, among other things, he explains the dogmas of Plato and Pythagoras and describes how Archimedes discovered the principle that bears his name and what results Eratosthenes and Archytas of Tarentum obtained when measuring the Earth.

In his opinion, only those who master all these subjects can reach the highest level of architecture, the "summum templum architecturae [the summit of architectural art; cf. Vitruvius, De architectura 1.1.11]". From an incorrect translation or interpretation of this statement arose the primacy of architecture over the genres of fine arts, which had a canonical effect from the Middle Ages until the 20th century.

The last book of his treatise is dedicated to machines, addressing topics such as traction machines, water-lifting machines, and a variety of war devices, including catapults, ballistae, and turtles. One of the highlights is his detailed description of the waterwheel in chapter X.5.

"The first variant consists of a large wheel with compartments that cover its entire diameter. Holes are drilled in these compartments so that water can enter when they are submerged in it, and then rise as the wheel turns. When it reaches the top of its travel, the water flows through a channel."

In his later description, Vitruvius mentions a second variant in which the compartments are only placed at the ends of the wheel, resulting in water being transported to a greater height, although in a smaller volume.

The third variant consists of a continuous chain of buckets that allows for much greater elevations, but requires additional effort.

Vitruvius' instructions in "De architectura" offer valuable insight into drainage systems and how they can be adapted to different needs and conditions.

The water wheel described by Vitruvius was of a vertical design, with water propelling it from below. It also included gears that changed the direction of rotation and increased the speed of the millstones. It is estimated that with the energy generated by one of these wheels, approximately 150 kg of wheat could be ground per hour, compared to the approximately 7 kg that two slaves could grind manually.

"De architectura," a work widely known and used in the Middle Ages, was first printed in Rome in 1486 by the humanist and grammarian Fra Giovanni Sulpicio da Veroli. This work provided Renaissance artists with a privileged channel for reproducing the architectural forms of Antiquity.

Although the decisive discovery of the codex is attributed to Poggio Bracciolini (St. Gallen, 1416), humanist interest in Vitruvius had already been fostered by Petrarch; after the dissemination of the works of this [4]Florentine, it

4 Francesco Petrarca (born in Arezzo on July 20, 1304, and died in Arquà Petrarca on July 19, 1374) was a prominent poet, philosopher, and philologist from Arezzo. He is recognized as the father of humanism and a fundamental pillar of Italian literature, especially thanks to his work "Canzoniere" (Songbook). His poetry gave rise to a literary movement known as Petrarchism, which influenced prominent authors such as Garcilaso de la Vega in Spain, and in England, literary figures of the stature of William Shakespeare and Edmund Spenser. Beyond his influence on new forms and themes in poetry, Petrarch also promoted a humanist conception that sought to harmonize the heritage of ancient Greco-Roman culture with the principles of Christianity. Furthermore, he advocated for the unification of all Italian territories with the aim of restoring the region's former glory during the Roman Empire. His legacy endures as an iconic figure in the history of literature and humanist thought.

can be said that Vitruvius became one of the principal textual sources for Renaissance architectural theory. The images that accompany Vitruvius's work in its editions up to the 18th century not only clarify and embellish the Greco-Roman treatise, but also reflect the different intentions and uses that this book had in early modern Europe.

Rico, Francisco. Petrarch: His Life, His Work, His Time. Barcelona: Planeta, 1974.

"The Ten Books on Architecture" represents the most copied and translated classical treatise on architecture in history. One of the seminal texts of the Italian Renaissance, it has come down to us as a compendium of ancient knowledge and, according to Vitruvius, is also the first Latin treatise that aimed to provide a comprehensive exposition of architecture and the state of knowledge in civil engineering at the time. These books are dedicated to the Emperor Augustus as a token of gratitude for his support. Although they have a textbook approach, they also possess literary elements, placing them more in the genre of non-fiction than purely specialized works. The oldest known copy of this work dates from the 9th century. Currently, more than ninety manuscripts of The Ten Books on Architecture have been preserved. No other writings attributed to Vitruvius are recorded. The only clues for dating the literary work are also provided by the work itself: based on information about individual Roman buildings, the beginning of the composition and final text of the book " The Ten Books on Architecture " can be dated to 27–23 BCE.[5]

Book structure:

Each of the ten books opens with a preface addressed to the emperor or with an anecdotal introduction to its subject matter.

The treatise is structured as follows:

- Book 1: Architectural training and basic architectural concepts; The founding of cities.
- Book 2: Construction Materials
- Books 3 and 4: Construction of the Temple

5Augustus, born Gaius Octavius in 63 BCE, was the first Roman emperor. Adopted by Julius Caesar in his will, he assumed Caesar's name after 44 BCE; modern historians commonly call him Octavian for the period before he received the title Augustus from the Senate in 27 BCE. In Greek sources Καῖσαρ (Kaisar) corresponds to Latin Caesar.

- Book 5: Public Buildings
- Book 6: Private Buildings
- Book 7: The Interior Design of Private Buildings; The Theory of Color.
- Book 8: Water Supply
- Book 9: Astronomy and Clockmaking.
- Book 10: Mechanical Engineering

Books 1 through 7 focus on the work of architects, while Books 8 through 10 address topics more closely related to engineering. In antiquity, these fields were closely intertwined. In the English-speaking world, the term " civil engineer," of Roman origin, is still used to describe civil engineers as opposed to military engineers. The profession of civil engineer exists similarly in Austria. In German, the terms "architect" and "engineer" often have overlapping meanings.

Regarding the architect's education, Vitruvius argues that their knowledge stems from the combination of two elements: "fabrica" (practical skill) and "ratiocinatio" (intellectual reasoning). This combination allows the architect to judge and understand all other trades. In the Renaissance, this distinction encouraged architects to break with medieval traditions and the builders' guild, allowing for a separation between the practical execution and the theoretical creation of designs. A prime example is Leon Battista Alberti[6], who dedicated himself to creating plans and models, leaving the construction of buildings to experienced project managers.

For the theoretical training of the architect, Vitruvius advocated an education in the liberal arts, transferring the need for a well-rounded education from Cicero's rhetoric to his own field. This relates to the need for a complete education championed by the Greeks (called "enkykliospaideia"). Vitruvius enumerated ten areas of knowledge that an architect should master for the

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6 **Leon Battista Alberti** (born in Genoa, Italy, on February 18, 1404, and died in Rome on April 25, 1472) was a prominent architect, personal secretary (apostolic abbreviator) to three popes (Eugene IV, Nicholas V, and Pius II), and distinguished as an Italian humanist, writer, mathematician, and poet. His skills and contributions were not limited to these disciplines, as he also excelled as a cryptographer, linguist, philosopher, musician, and archaeologist. Alberti stands out as one of the most versatile and influential humanists of the Renaissance, and his legacy spans a wide range of fields of knowledge.

benefit of their architectural work, from writing and drawing to music and astronomy. He argues that only those who master these subjects can reach the highest level of architecture, the "summum templum architecturae" [the pinnacle of architectural art; cf. Vitruvius, De architectura 1.1.11]. However, a misinterpretation of this statement led to the primacy of architecture over the fine arts, a concept that influenced from the Middle Ages to the 20th century.[7]

Vitruvius lays down three cardinal requirements for any building — *firmitas*, *utilitas*, and *venustas*, that is, that it should stand firm, serve its purpose, and please the eye — and he treats the three as equal in weight (De architectura 1.3.2). Beyond them he sets out six governing concepts of architectural theory: *ordinatio*, the orderly and modular arrangement of the parts according to a chosen unit; *dispositio*, the conception and layout of the work; *eurythmia* (*εὐρυθμία*), the visual harmony that follows from the right application of *symmetria* (De architectura 1.2.3); *symmetria*; *decor*; and *distributio* — which between them treat the building's proportions, its design and disposition, its stylistic propriety, and the distribution of materials and costs.

Vitruvius also linked the different architectural orders (Doric, Ionic, and Corinthian) with specific construction tasks, assigning each a distinctive expression. The principle of the Orient, which states that the temple idol should face west, is another of Vitruvius's construction concepts that influenced the orientation of temples and altars.

Vitruvius is known for his detailed description of the architectural orders — the Doric, Ionic, and Corinthian —, as well as their proportions and decorative elements.

These architectural principles influenced the development of the system of column orders in the Renaissance, a canonical system of forms and proportions for columns. Columns and architectural orders continued to be a fundamental component of Renaissance and later architecture.

According to current research, "The Ten Books on Architecture" offers the oldest and most comprehensive treatment of a wide range of subjects, including ancient technology, timekeeping, construction machinery,

7Marcus Tullius Cicero (106–43 BCE) was a Roman orator, statesman, philosopher and author. His prose is a central point of reference for the Latin of the late Republic.

waterwheels, war machines, architecture, and interior design. This work comprehensively covers all aspects of construction and technology of the period. Before its publication, only brief compendiums and treatises addressing individual issues likely existed. Thanks to his many years of experience, Vitruvius was able to accumulate extensive and diverse knowledge. He also incorporated a large number of Greek sources into his work, as evidenced by a catalog that appears in the preface to Book 7. In his explanations about the construction of temples, he relied heavily on the writings of the architect Hermogenes.[8]

Despite a few isolated mentions, such as those by Frontinus, Faventinus, and Pliny the Elder, Vitruvius's work received a limited response in ancient literature. This may have been partly due to Vitruvius's focus on Greek architecture, resulting in a lack of references to Roman developments in construction, such as amphitheaters, vaulting technology, and the use of pillars and arches. Furthermore, Vitruvius's work may have been overlooked because of its somewhat convoluted writing style, which was not particularly popular in antiquity. It may have been used as a handbook by architects during the imperial period, but Vitruvius's descriptions, especially the details, can rarely be corroborated by archaeological evidence.

“Frontinus took as his model the work of Vitruvius, De architectura, which speaks of the construction and maintenance of aqueducts in the previous century.” Coincidentally, Julius Frontinus’s report was attached to the first edition of Vitruvius published in Rome”.

Most outstanding work, *" De aquaeductu" or "De aquaeductu urbis Romæ, "* is presented as an official report intended for the emperor, and its purpose is to record the state of Rome's aqueducts. *"De aquaeductu"* offers a detailed narrative of the history and description of the water supply in Rome, encompassing both the regulations related to its use and maintenance.

8Hermogenes of Alabanda (Ἑρμογένης) was a Greek architect associated with Alabanda in Caria. Vitruvius connects him with the development of the pseudodipteral temple and with a preference for the Ionic over the Doric order. Among the works traditionally attributed to him are the temple of Artemis at Magnesia on the Maeander and the temple of Dionysus at Teos.

Frontinus describes the aqueducts supplying Rome in his own time: Appia, Anio Vetus, Marcia, Tepula, Julia, Virgo, Alsietina, Claudia and Anio Novus. His account covers their construction, routes, dimensions, supply, distribution and legal administration. It provides an essential comparison for Vitruvius's discussion of water. The Aqua Traiana belongs to a later phase and should not be included among Frontinus's nine aqueducts (De aquaeductu 3–4).

In the case of Faventinus, Marcus Cetius Faventinus probably wrote a specialized publication in Latin in the 3rd century on various topics of architecture and construction. It was based largely on Vitruvius' Ten Books of Architecture (De architectura libri decem).

"Two manuscripts bear the title M. Ceti Faventini artis architectonicae privatis usibus adbreviatus liber."

Hugh Plommer, Vitruvius and Later Roman Building Manuals, Introduction, 1.

Faventino structures his book into 29 sections of varying length, often addressing a single topic across multiple consecutive sections. The work focuses primarily on the techniques necessary for house construction, detailing processes such as lime and brick making, masonry construction, and wood preparation.

Furthermore, the author addresses water provision through the construction of wells or aqueducts, the orientation of houses according to wind direction using a compass rose, and the planning of spaces designated for bathrooms. The information presented is concise and objective, lacking poetic embellishments or other superfluous elements.

In the last chapter, Faventino addresses the construction of sundials in a practical way, without going into detailed astronomical explanations, since most people simply want to know the current time, as the author expressed, " what time is it (.quota sit hora solum requirunt [that is: « they only want to know what time it is »). "

In his preface, Faventinus refers to both Vitruvius and other authors (alii auctores). In his work, Faventinus relies primarily on Vitruvius as a source of inspiration. However, it is in Chapter 29, "De horologii Institutione" (On the Construction of Timekeeping Instruments), where Faventinus uses a different source for a more extensive text, even though Vitruvius also addresses the topic.

In Faventinus's book, all topics related to public buildings, such as Vitruvius's Book 3 on temples, are omitted, as are areas that have only an indirect connection to architecture, such as Vitruvius's Book 5, Chapter 4 on the Doctrine of Harmony. Furthermore, Faventinus adds his own approach and deviates from Vitruvius's ideas on several occasions. An example of this is Chapter 28, "De normae invente" (The Construction of the Right Angle). While Vitruvius addresses this topic in the preface to Book IX and uses the Pythagorean theorem, Faventinus approaches it imprecisely and without referencing a Greek mathematician. His practical approach is expressed in the statement: "You take three rulers, two of 2 feet, one of 2 feet 10 inches, and form a triangle. " In this instance, Faventinus presents his own interpretation without explicitly mentioning Pythagoras.

Hugh Plommer: Vitruvius and Roman Building Manuals, Introduction

In three medieval manuscripts, Vitruvius's work is immediately followed by the text we are analyzing, entitled "De diversis fabricis architectonicae." However, in two other manuscripts, this direct connection to Vitruvius's text is not found, under the title " M. Ceti Faventini artis architectonicae privatis usibus abbreviatus liber." In the Middle Ages, Faventinus's name was forgotten, unlike Vitruvius's. Despite this neglect, detailed research comparing the texts indicates that both Palladius's and Isidore of Seville's texts are not derived from Vitruvius, but directly from Faventinus's work. This suggests that, despite Faventinus's lack of recognition in the Middle Ages, his influence and contributions to architecture endured and were transmitted through other sources and authors, such as Palladius and Isidore of Seville.

Hermann Nohl on the relationship between Palladius, Faventinus, and Vitruvius. Valentin Rose, ed., Vitruvii de architectura libri decem (Leipzig: Teubner, 1899), preface.

Text editions:

Rose, Valentin, ed. *Vitruvii De architectura libri decem*. Leipzig: Teubner, 1867, 285–313 (De diversis fabricis architectonicae).

Krohn, Fritz, ed. Vitruvii de architectura libri decem. Leipzig: Teubner, 1912.

Plommer, Hugh. *Vitruvius and Later Roman Building Manuals*. Cambridge: Cambridge University Press, 1973, 39–85.

Cam, Marie-Thérèse, ed. *Cetius Faventinus: Abrégé d'architecture privée*. Collection des Universités de France, série latine 363. Paris: Les Belles Lettres, 2001. ISBN 978-2-251-01423-4.

Brodersen, Kai, and Christiane Brodersen, eds. *Cetius Faventinus: La casa romana / De architectura privata*. Latin and German. Wiesbaden: Marix-Verlag, 2015. ISBN 978-3-7374-0998-8.

"The Ten Books on Architecture" was a text that remained in use throughout Late Antiquity and the Middle Ages, with around ninety medieval manuscripts, including an Anglo-Saxon version and a Carolingian version dating from around the year 800, which was known to Einhard. Copies of the work were found in monastic libraries such as those of St. Gallen, Cluny, Canterbury, and Oxford, among others.

Vitruvius achieved great fame in later periods, especially during the Renaissance. During this time, a new architectural style that took Antiquity as its model turned to Vitruvius to learn the fundamentals of Roman architecture. Searches were made for manuscripts of Vitruvius in monastic libraries, such as the one at Poggio Bracciolini. In 1511, Fra Giovanni Giocondo da Verona published another edition in Venice, and in 1521 the first (illustrated) Italian edition by Cesare Cesariano was printed. Although Italian remained the primary language of European architectural theory for a long time, translations into other languages quickly followed. Walther Hermann Ryff published the first German translation in 1548. He also published a commentary around the same time.[9]

"In his old age, Vitruvius concentrated on writing and benefited from a pension granted to him by Augustus to ensure his financial independence. Between 27 and 23 BCE, he composed his work, Ten Books on Architecture (original title: De architectura libri decem). There is no information about the date of Vitruvius's death, suggesting that he enjoyed little popularity during his lifetime. The date of his death is not known with certainty; most scholars assume he was still alive after 15 BCE."

9**Cesare Cesariano** (born ca. 1477 in Milan; died 30 March 1543) was an Italian painter, architect, and military engineer. In 1521 he published the first Italian translation of Vitruvius, to which he added a commentary and woodcut illustrations.

Albrecht, Michael von. *Geschichte der römischen Literatur von Andronicus bis Boethius und ihr Fortwirken*. Vol. 1. 3rd, rev. and enl. ed. Berlin: Walter de Gruyter, 2012. ISBN 978-3-11-026525-5.

- Baldwin, Barry. "The Date, Identity, and Career of Vitruvius." *Latomus* 49 (1990): 425–434.
- Callebat, Louis. "Rhetoric and Architecture in Vitruvius's *De architectura*." In *Le projet de Vitruve: Objet, destinataires et réception du De architectura*, 31–46. Collection de l'École française de Rome 192. Rome: École française de Rome, 1994.

From the 15th century onwards, Vitruvius influenced a large number, if not essentially all, of European architectural treatises and European architectural theory well into the 19th century. In 1452, Alberti published his " De re aedificatoria, " which followed Vitruvius in its structure and theoretical framework.

In the 18th century, François de Cuvilliés used the title " Vitruve Bavarois" for his textbook. The English architect William Newton (1735–1790) wrote an English translation and a French commentary on Vitruvius, published in 1780. This was the first academic discussion of " De architectura." This edition includes numerous full - page illustrations. One of only two known copies in German libraries is held at the Central Institute for Art History in Munich; the other is in the Mainz City Library and is part of a rare collection.

A central passage in Vitruvius's treatise introduces the theory of the "well-formed man" (*homo bene figuratus*). [10]The proportions of people in relation to one another are described using geometric shapes. This inspired sketches by several Renaissance artists, including Albrecht Dürer of Nuremberg, Mariano di Jacopo Taccola, Pellegrino Prisciani, and Francesco di Giorgio Martini. The most famous illustration comes from Leonardo da Vinci and became known as the "Vitruvian Man." With this drawing, Leonardo demonstrated Vitruvius 's thesis that the upright human being fits into both the

10The formulas homo ad quadratum and homo ad circulum, commonly used in specialized literature, belong to the Renaissance interpretative tradition (Cesariano, Leonardo). Vitruvius (3.1.3) describes the proportions of the body inscribed in the circle and the square, but he does not use these Latin expressions as such; they are retained here for their conventional value.

geometric shape of the square and the circle. A representation of man within the squaring of the circle.

The module method, established by Vitruvius, was revived in the 20th century as the "Modulor", a system of measurements designed by the architect Le Corbusier and based on the golden ratio.

One of the most important German collectors of Vitruvius's works was the architect Bodo Ebhardt. Ebhardt owned an extensive collection of editions of Vitruvius, whose annotated catalog he published in 1919.

To understand the independent reception of the term " module ", one can also refer to the word " model".

Some of the modern copies and translations of Vitruvius' treatise, " The Ten Books on Architecture ".

For digital copies of many other editions:

- Claude Perrault's Abrégé (1674) is distinct from his full French translation of Vitruvius (1673; revised 1684). Full publication details are gathered in the bibliography.
- Blondel: Rules of the Five Orders of Architecture. Newly Revised, Corrected and Reduced from Large to Small by Monsieur Blondel, Architect to the King in 1752, with Several Augmentations by Michelangelo Bonaroti, Vitruvius, Scamois, d'Avilert, Mansart and Others, Paris, 1752.
- Rode, August, trans. Vitruvius: Architecture. 2 vols. Photomechanical reprint of the Göschen edition (Leipzig, 1796). Edited with image selection by Beat Wyss; introduction by Georg Germann. Basel: Birkhäuser, 1987.
- Reber, Franz, trans. Vitruvius: Zehn Bücher über Architektur / De architectura libri decem. Stuttgart: Krais & Hoffmann, 1865. Reprint, Wiesbaden: marixverlag, 2009. ISBN 978-3-86539-212-1.
- Rose, Valentin, and Hermann Müller-Streibling, eds. Vitruvii De architectura libri decem, ad antiquissimos codices nunc primum edita. Leipzig: Teubner, 1867.
- Nohl, Hermann. Index Vitruvianus. Leipzig: Teubner, 1876. (Complete word-index to the text of Vitruvius.)
- Krohn, Friedrich, ed. Vitruvii De architectura libri decem. Leipzig: Teubner, 1912.

• Granger, Frank, ed. and trans. Vitruvius: On Architecture. Loeb Classical Library. 2 vols. London: Heinemann, 1931.
• Fensterbusch, Curt, ed. and trans. Vitruvii De architectura libri decem / Zehn Bücher über Architektur. Latin and German. Darmstadt: Wissenschaftliche Buchgesellschaft, 1964. 6th ed., 2008. ISBN 978-3-534-21964-3.
• Rowland, Ingrid D., and Thomas Noble Howe, trans. Vitruvius: Ten Books on Architecture. Cambridge: Cambridge University Press, 1999. ISBN 0-521-00292-3.

De architectura continued to circulate during the Middle Ages, and Renaissance interest should not be described as the recovery of a wholly lost text. Petrarch, Boccaccio and later humanists participated in its renewed reception. The history of Poggio Bracciolini's manuscript discoveries must be distinguished from the documented provenance of Harley MS 2767: the British Library records its association with St Pantaleon in Cologne and its later passage through the collections of Graevius, the Elector Palatine, Zamboni and the Harleys. That catalog does not establish the familiar identification of this codex with a manuscript found by Poggio at St Gall in 1416.

Despite this, in the Renaissance, there was a renewed interest in the writings of Greco-Roman Antiquity and an increase in the analysis and knowledge of the architectural remains of Antiquity, which contributed to a greater dissemination and understanding of the work of Vitruvius.

The credit for making Vitruvius's work widely known belongs to Leon Battista Alberti (1404–1472), who incorporated it into his fundamental treatise on architecture, "De Re Aedificatoria" (circa 1450). The first known edition of Vitruvius's "De architectura" was published in Rome by Fra Giovanni Sulpicius in 1486. Subsequently, translations were made into Italian, French, English, German, Spanish, and other languages. The original illustrations had been lost, and the first illustrated edition was published in Venice in 1511, with woodcuts based on the descriptions in the text, probably by Fra Giovanni Giocondo. Later, in the 16th century, Andrea Palladio provided illustrations for Daniele Barbaro's commentaries on Vitruvius in the Italian and Latin versions. However, the most famous illustration remains Leonardo da Vinci 's "Vitruvian Man."

The surviving ruins of ancient Rome, such as the Roman Forum, temples, theaters, triumphal arches, reliefs, and statues, provided numerous visual examples of the descriptions presented in Vitruvius's text. Therefore, this book quickly became a major source of inspiration for Renaissance, Baroque, and Neoclassical architecture. Architects like Filippo Brunelleschi drew inspiration from Vitruvius's "De architectura" when designing and constructing masterpieces of Renaissance architecture.

Vitruvius is often loosely described as the first architect, but it is more accurate to describe him as the earliest architect whose complete theoretical treatise has survived to this day. Although he mentions earlier works, these are less comprehensive. Vitruvius proved to be at least an original thinker and possessed the creative intellect to systematize existing architectural practice. It is important to note that Vitruvius had a much broader scope in his field than modern architects. Roman architects were involved in a wide variety of disciplines; in modern terms, they might be considered a combination of engineers, architects, landscape designers, artists, and craftspeople. The word "architect" originates from Greek words meaning "master" and "builder." The first of Vitruvius' ten books addresses many topics that today would be considered part of what we now call urban planning and landscape architecture.

Architect (from the Ancient Greek *ἀρχιτέκτων*, architekton, ' architect ' or ' chief builder ,' composed of *ἀρχός*, archos ' chief ,' ' guide ' cause of the universal architectural principle and *τέκτων*, tekton, ' builder '). The universe as an architectural cause.

In 1486, Fra Giovanni Sulpicio da Veroli published the first edition of the work in Latin, without translation. Fra Giovanni Giocondo followed, and in 1521, Cesare Cesariano presented the first printed Italian translation. These editions were followed by others translated into the languages of the publishing countries.

The work, structured in ten books, encompasses all the knowledge of the time regarding architectural theory and practice. It is not limited to the art of building construction, but also deals with public works and the design of machinery for building construction. Vitruvius begins with the general principles of architecture and the selection of appropriate sites for the construction of cities and dwellings in the first book.

The second book is dedicated to the various materials used in construction, such as brick, stone, lime, and wood. In books three and four, Vitruvius addresses temples and architectural orders, then in the fifth book he discusses public buildings.

The sixth book focuses on private buildings and their dimensions, while the seventh is dedicated to the decoration and ornamentation of buildings. The eighth book deals with hydraulics and explains procedures for finding and conveying water. The ninth book is a treatise on gnomonics (the art of constructing sundials and measuring time), and the tenth book addresses the study of construction machinery.

The library of the School of Architecture of Madrid preserves several copies of different foreign and Spanish editions that have been produced over the centuries.

These are interesting details about some of the foreign and Spanish editions of Vitruvius' treatise "De architectura":

Foreign Editions:

- Cesare Cesariano, Como, 1521: Cesariano presented the first printed Italian translation. However, during printing in 1521, it was discovered that the proofreaders had altered the text without consulting Cesariano, resulting in a conflict that was finally resolved in his favor in 1528.
- Florentiae**, 1522**: A Latin edition with few figures and corrections to errors in previous editions.
- **Daniele Barbaro, Venice, 1567:** Barbaro published one of the first Italian translations of the treatise, with improved illustrations compared to earlier editions. Andrea Palladio, a famous architect, contributed some of the drawings.
- Perrault**, A Paris, 1684**: The French edition produced by Claude Perrault, a French scientist, is known and highlighted for its beauty and careful illustrations.
- Galiani, Naples, 1758: Galiani was an expert in classical architecture and archaeology. His bilingual translation was accompanied by finely engraved plates prepared for the edition.

Vitruvius Pollio, Marco—Paris: Lahure, 1909

Bilingual Latin-French edition by Auguste Choisy, architect and construction historian, in four volumes. Without footnotes, the first volume is dedicated to an extensive introduction and is notable for its technical and construction analysis, a significant precursor to editions geared towards architects.

Spanish Editions:

- **Hernán Ruiz (16th Century)**: Hernán **Ruiz** produced an early version of Vitruvius in Castilian, limited to the First Book, although the translation is considered unfortunate.
- **Lázaro de Velasco, 1564**: The manuscript of Lázaro **de** Velasco is an early and rich version of Vitruvius's treatise in Castilian Spanish. It offers enriching annotations and commentaries on the text.
- **Miguel de Urrea, Alcalá de Henares, 1582**: This was the first edition printed in Spain, with a translation by Miguel de Urrea. It contains 126 woodcut engravings and is known for its "crude and lacking literary style" translation.
- **Joseph Castañeda, Madrid, 1761**: This edition is a greatly abridged version of Vitruvius's treatise, with few illustrations. It was the first edition in Spain for centuries.
- José Ortiz y Sanz, Madrid, 1787: Ortiz y Sanz produced a translation based on multiple previous editions and his personal experience in Italy. His edition includes 56 plates engraved by prominent engravers of his time.

All these editions contributed significantly to the dissemination and study of Vitruvius' treatise, and each of them has its own unique characteristics and contributions to the field of architecture and philology.

"Architecture is a science adorned with many other disciplines and knowledge, by whose judgment the works of the other arts are appraised. It is practical and it is theoretical. The practical aspect is a continuous and expeditious frequency of use, executed with the hands, on the material corresponding to what is desired to be formed. The theoretical one is that which knows how to explain and demonstrate with subtlety and laws the proportion, the works executed. It has, like the other arts, those two things of signified and signifier. Signified is the thing proposed to be treated. Signifier is the demonstration of the thing with scientific reasons ..."

Pages 2 and 3 of the Madrid edition, 1787, by Josep Ortiz.

First Thales said that water was the first principle of things. Heraclitus of Ephesus said it was fire. Democritus and his follower Epicurus said it was atoms. But Pythagoras simply said water and fire

" He added the air and the earth. "

Page 31, in Op. Cit.

Analysis of the work

"De architectura" (also known as "Ten Books on Architecture, " De architectura libri decem) is a treatise written by the Roman architect and military engineer Marcus Vitruvius Pollio; c. 80–70 BCE – d. after 15 BCE. This work is dedicated to his patron, Emperor Caesar Augustus, and his sister Octavia Minor, to whose commendation Vitruvius attributes his introduction to the emperor. The treatise serves as a guide for building projects. Notably the only architectural treatise to have survived from antiquity, it has been considered, since the Renaissance, as the first known book on architectural theory. Furthermore, it has been recognized as a fundamental source on the canon of classical architecture.[11]

" That reward, which you initially granted me, you have maintained on the recommendation of your sister. Therefore, being obliged by this favor that allows me to live without hardship until the end of my life, I began to write these books for you, for I realized that you had erected many buildings, that you were currently erecting others, and that in the future you would put your effort into building public and private buildings in accordance with the magnitude of your deeds, so that your memory may endure in posterity. "

Vitruvius, De architectura (written between 27 BCE and 23 BCE).

In that location, Octavia also erected two public libraries, one for Latin books and the other for Greek books. It is plausible that the collections from Marcellus's private library served as the basis for these. The ancient map of Rome, the Forma Urbis Severiana, reveals the presence of an exedra connecting the temples and the libraries, possibly a space intended for recitations and, occasionally, for Senate sessions.

Within the portico, Octavia incorporated a gallery of statues, among which was a representation of Cornelia, the mother of the Gracchi. This statue gained renown for being the first female statue publicly displayed in Rome.

Vitruvius, who likely had knowledge of this work and whose treatise Octavia was familiar with, wrote about porticoes in cities: "The spaces between

11 Octavia the Younger (c. 69–11 BCE) was Augustus's sister. The Porticus Octaviae, rebuilt in her honor after 27 BCE, housed the libraries she established in memory of her son Marcellus.

the porticoes should be open to the air and, in my opinion, should be adorned with green plants, since open walkways offer greater health benefits." He expounds the idea that open-air walkways are beneficial to visual and physical health, providing a clear connection between architecture and public health. Vitruvius advocated for the creation of wide and decorative open-air walkways in all cities, highlighting their advantages in both times of peace and war. These walkways, according to him, contribute to the health and safety of cities.

According to Plutarch's account, Octavia, between 27 and 23 BCE, dedicated her resources to the construction of a portico in honor of her deceased son. This portico took the form of a colonnaded quadrilateral, encompassing approximately 119 by 135 meters, and surrounded the temples of Juno Regina and Jupiter Stator. The last temple, highlighted by Vitruvius in his treatise, was located near the Theater of Marcellus. Although it was common for Roman women to commission the construction of small temples and sanctuaries, the Portico of Octavia stands out as possibly the first urban-scale intervention carried out by a woman in Rome.

The contemporary wording at the time of the portico's construction raises the intriguing question of whether Vitruvius was present during the work and, if so, in what capacity he participated? Did he perhaps play an advisory or consultative role in the realization of this architectural project?

Architectural program of the portico was later replicated by Livia, Octavian's wife, around 15 BCE on the Esquiline Hill. The shared choice of this type of building, which served functions related to health, culture, and memory, does not appear to have been accidental. Both women, Octavia and Livia, demonstrated a shared appreciation for a multifunctional architectural space that addressed diverse needs of Roman society.

Over the years, the portico underwent several transformations, faced fires and earthquakes, and finally, in the year 770, it was built on top of the entrance propylaeum of the church of Sant'Angelo in Pescheria, evidencing its evolution and adaptation over the centuries.

The death of Octavia, which occurred in 11 BCE (although some ancient sources offer slightly different dates), highlights her importance in Octavian's life. The emperor bestowed upon her the highest funeral honors, granting her exceptional treatment as a state hero, which was unusual for

women's funerals at that time. This gesture underscores the significance and respect Octavian held for his sister, solidifying her legacy in Roman memory.

Vitruvius and his principles. It is worth clarifying a common misconception: although Vitruvius does explicitly state the triad of firmness (*firmitas*), utility (*utilitas*), and beauty (*venustas*) in De architectura 1.3.2, he does not present it as a universal and abstract axiom upon which all architecture "depends," but rather as the three qualities that a well-made work must possess, within the specific context of building construction. The interpretation of the triad as a canonical and autonomous formula was consolidated later. However, after the publication of a summary of the work by Claude Perrault in 1673, which showed little respect for the original, the so-called Vitruvian triad became established and became a veritable "legend" repeated by generations of architects.

In fact, when Vitruvius dares to attempt an analysis of the art he writes about, he proposes to understand architecture as composed of four elements: architectural order (relationship of each part with its use), arrangement (" The kinds of arrangement [...] are the layout in plan, in elevation and in perspective "), proportion (" Uniform concordance between the whole work and its parts ") and distribution (in Greek oikonomía, it consists " in the proper and best possible use of materials and land, and in ensuring the lowest cost of the work achieved in a rational and balanced way ").

It must be realized that his doubts on this matter are quite intense, since four pages later he divides architecture into three parts: construction, gnomonics, and mechanics (Vitruvian Royal Framework [Artus Vitruviani regii: expression of the author's interpretation; in classical Latin, artus means " joints, " not " conceptual framework "]). However interesting and suggestive this may be, it should not be forgotten that this treatise is the only classical treatise that has come down to us, and the probability that it is the best of its time is small.

The history of the various versions of Vitruvius's treatise aptly summarizes the conflict surrounding the definition of architecture. In 1673, Claude Perrault, a physician and physiologist specializing in cadaver dissection and a skilled draftsman, published his abridged translation of Vitruvius's treatise, which was completely reorganized. However, it was through Perrault 's

" summary " that Vitruvius was disseminated and influenced the treatises and theories of subsequent centuries. And it is in this summary that the Vitruvian triad emerged: *firmitas*, the concepts of *firmitas* (firmness), *utilitas* (utility), and *venustas* (beauty).

Public buildings must satisfy three conditions: *firmitas* (structural soundness and durability), *utilitas* (functional convenience and proper distribution of space), and *venustas* (elegance and beauty of appearance). Critical note: The translation of " *firmitas* " as " strength " is inaccurate; the Latin term designates the stability achieved through the correct selection of materials and the solidity of the foundations. " *Venustas* " is not simply " beauty " but the visual grace that results from correct proportions; cf. Vitruvius, De architectura 1.3.2, and the discussion in Rowland and Howe, 1999, 66.

- The stability of any building is intimately linked to its structure.
- Regarding utility, a more abstract concept, consideration is given to both the minimum requirements to guarantee comfort and functionality in the use of an independent space and the efficient relationship and communication between the different spaces that make up the architectural program, which shapes a typology (i.e., the function - space relationship).
- On the other hand, beauty, an aspect that can be considered subjective and inherent, is linked to the aesthetic value that arises from the interaction between various design elements. These elements encompass the proportions used to dimension the building's components, the architect's characteristic style, the building's personality, the materials used in its finishes, and the design of the architectural elements, whether functional, structural, or decorative.

The substantial difference between Perrault's version and the previous ones lies, according to José Luis González Moreno-Navarro, in that Perrault misrepresents " the synthetic character of architecture in a strictly analytical vision and fragmented into three autonomous branches [which] is a consequence of his mental structure [.] formed throughout a dedicated life to

the analysis of living organisms, which evidently at no time recomposed and gave life again.[12]

On the contrary, according to Vitruvius, "Architecture is a science that arises from many other sciences, and is adorned with very varied learning; by the help of which a judgment is formed of those works that are the result of other arts. Practice and theory are its parents. Practice is the frequent and continuous contemplation of the way of executing some given work, or of the mere operation of the hands, for the conversion of matter in the best and most perfect way. Theory is the result of that reasoning which demonstrates and explains that the wrought material has been converted to result in the proposed end. For the merely practical architect is not capable of assigning sufficient reasons for the forms he adopts; and the theoretical architect also fails, grasping the shadow instead of the substance. " He who is both theoretical and practical, therefore built doubly; able not only to prove the suitability of his design, but equally able to carry it out in execution. "

The work of Vitruvius is a prime example of Latin texts that owe their survival to Charlemagne's palace *scriptorium, which was active in the early 9th century as part of the Carolingian Renaissance. The scriptorium's*[13] *primary function* was the search for and copying of classical manuscripts. In particular, many of the surviving copies of Vitruvius's works are derived from a manuscript found in that setting, known as the British Library's Harley Manuscript 2767[14].

12Art Directory GmbH website (accessed 9 March 2008); see also Vázquez (2000) for further bibliography. "Details of an Item from the British Library Catalog of Illuminated Manuscripts," Bl.uk, 30 November 2003 (accessed 16 November 2012). Krinsky, Carol Herselle. "Seventy-Eight Vitruvius Manuscripts." Journal of the Warburg and Courtauld Institutes 30 (1967): 36–70.

13 The term "scriptorium," which literally means "a place for writing," is commonly used to refer to the designated room or space in medieval European monasteries where monastic scribes copied and transcribed manuscripts. These scriptoria were important centers of book production in the Middle Ages, where knowledge was preserved and transmitted through the copying of ancient texts and the creation of new manuscripts. Monastic scribes played a crucial role in the preservation and dissemination of literature, religion, and knowledge during that historical period.

14"Details of an Item from the British Library Catalog of Illuminated Manuscripts," Bl.uk, 30 November 2003 (accessed 16 November 2012).

These texts were not only copied, but also became known at Charlemagne's court. The court historian, Bishop Einhard, even requested explanations of some technical terms from Alcuin, an English clergyman who was visiting. Furthermore, it is known that several people read the text or were indirectly influenced by it. Some of these individuals include Vussin, Hrabanus Maurus, Hermann of Reichenau, Hugh of Saint Victor, Gervase of Melkey, William of Malmesbury, Theoderic of Saint Trond, Peter the Deacon, Albertus Magnus, Filippo Villani, Jean de Montreuil, Petrarch, Boccaccio, Giovanni de Dondi, Domenico di Bandino, Bernward of Hildesheim, and Thomas Aquinas. In 1244, the Dominican friar Vincent of Beauvais made numerous references to "De architectura" in his compendium of all knowledge of the Middle Ages, called "Speculum Majus".

In the 14th century, the Florentine nobleman Niccolò Acciaioli bequeathed copies to the Basilica of San Lorenzo in Florence[15].

Despite the existence of many copies of "De architectura" dating from the 8th to the 15th centuries, the work primarily survived in manuscript form. Currently, more than ninety manuscripts are preserved. manuscripts in public collections, but they appear to have received relatively little attention during the Middle Ages, possibly due to the obsolescence of many specialized Latin terms used by Vitruvius and the loss of most of the original 10 illustrations, which are considered useless for understanding parts of the text.

Vitruvius: The Great Architect of Greco-Roman Antiquity / Francesco Pellati; translated from the Italian [by Jose A. Merediz].

Pellati, Francesco. *Vitruvius: The Great Architect of the Greco-Roman Age*. Translated from the Italian by José A. Mercau. Buenos Aires: Clot Editions, 1944.

Buenos Aires: Clot Editions, 1944.

In English, John Shute drew inspiration from Vitruvius's text as early as 1563 to write his book "The First and Chief Grounds of Architecture." Sir Henry Wotton's 1624 work, "Elements of Architecture," is an adaptation

15 Krinsky, Carol Herselle (1967), "Seventy-Eight Vitruvius Manuscripts", Journal of the Warburg and Courtauld Institutes, The Warburg Institute. 30: 36–70. doi:10.2307/750736. JSTOR 750736. S2CID 195019013.

heavily influenced by Vitruvius. However, English speakers had to wait until 1771 for a complete translation of the first five volumes of "De architectura" and until 1791 for access to the complete work in English.

Thanks to the invention of the printing press, Vitruvius's work was widely disseminated and became a subject of great importance for architects. Detailed and interpretive illustrations were produced that helped to understand and apply Vitruvius's principles in architecture.

The Codex through the Centuries

In the Roman world, his text continued to serve as a technical manual and scholarly work, being known and used in the 1st century BC by Pliny the Elder and by Frontinus in their works, but in the following century there are no known references to Vitruvius.

In Pliny the Elder's "Natural History" (23-79), Vitruvius is cited as a reference when discussing architectural orders, masonry, and other topics. In the same century, Frontinus mentions him in his treatise on the aqueducts of Rome.

In the 3rd century AD, among the compilers and commentators who followed him were Cetius Faventinus, who used it in his Artis architectonicae, and Gargilius Martialis, in a compendium on architecture whose title is unknown.[16][17][18]

And before the Middle Ages, Aemilianus, known as Palladius, in his *De re rustica *, made use of Vitruvius's text; Servius, in his *Commentarii on Virgil's Aeneid*, quotes Vitruvius; the polymath Martianus Capella shows in his *Encyclopedia* his knowledge of *De architectura*, and Sidonius Apollinaris praises the Roman architect, comparing him with other scholars of antiquity. Throughout the Middle Ages, the memory of Vitruvius's treatise was not lost. Boethius, Cassiodorus, and Saint Isidore of Seville read it as scholars who strove to passionately gather all that had been intellectually produced in the ancient world, although Vitruvius's advice was of no use to the modest builders of that

16Marcus Cetius Faventinus was a Roman author whose architectural compendium depends extensively on Vitruvius. The surviving work, Artis architectonicae privatis usibus abbreviatus liber, offers a deliberately practical account of building for private use and provides little secure autobiographical evidence.

17Marcus Cetius Faventinus, Artis architectonicae privatis usibus abbreviatus liber ('An Abridged Book of Architectural Technique for Private Use'). The work depends extensively on Vitruvius and provides little autobiographical information. Its preface announces a deliberately practical treatment, concerned chiefly with private building and addressed to builders rather than an exhaustive discussion of architectural theory.

18Quintus Gargilius Martialis was a third-century CE Roman writer on horticulture, botany and medicine. Some scholars identify him with the military commander of the same name recorded in a Latin inscription of 260 CE; that identification requires caution. Fragments survive of an agricultural and medicinal work probably entitled De hortis.

time. During the Carolingian Renaissance, Vitruvian knowledge was revived, and his theories were even put into practice by Einhard in his classical buildings. Copies of the Vitruvian codex proliferated during the 9th and 10th centuries, based on the lost Codex Archetypus, with known examples found in the monastic libraries of Reichenau, Fulda, St. Gallen, Murbach, Lorsch, and Mainz. However, references to the Vitruvian text and its codices are scarce in the 11th and 12th centuries.[19]

Again, in the 13th century, Vincent of Beauvais, Saint Albert, and Saint Thomas Aquinas took an interest in Vitruvius's treatise and commented on it in their respective writings. The vigorous 14th century, with its renewed Christianity, fostered the theories of the Roman master, and the appearance of his codex and subsequent dissemination among the first Italian pre-humanists took on the significance of a discovery.

Petrarch and his circle knew and studied it. It was in the second half of the 14th century that Francesco Petrarch, the prince of the Trecento humanists, is believed to have acquired his codex; his attempt at a translation from Latin to Italian remained unfinished. He was later followed by Boccaccio[20], the Paduan physician Dondi dall'Orologio, the bibliophile Nicola Acciainoli, and Domenico di Bandino.

In pre-humanist Italy, where Filippo Brunelleschi and an unforgettable group of artists shone with their architectural works, we find the theorists Cennino Cennini, Filippo Villani, and Lorenzo Ghiberti, who studied and commented on Vitruvius's treatise. In 1416, the humanist Poggio Bracciolini unearthed a copy of the Vitruvian Codex in the library of the

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19 Rutilius Taurus Aemilianus Palladius was a late antique Roman writer on agriculture. Little is securely known about his life; his surviving agricultural treatise is conventionally known as the Opus agriculturae.

20 **Giovanni Boccaccio** (pronounced [d͡ʒo' van :i bo'k:at͡ʃ: o]) was born on June 16, 1313, in Certaldo, Florence, and died on December 21, 1375, in Certaldo. He was a prominent Italian writer and poet, as well as a major figure in the humanism of the early Renaissance. His most famous work is the "Decameron," a collection of one hundred short stories that portrays the diverse society of the 14th century. This work established him as a founder of the prose narrative tradition in Europe. Boccaccio is known for his significant contribution to the literature and culture of his time, and his influence continues to resonate throughout the history of Italian and European literature.

monastery of St. Gall, which stirred the spirit of the time and served to increase interest in Vitruvius's concepts. Copies of the text followed, and in 1440, Pier Candido Decemborio sent one from Florence to the Duke of Gloucester, indicating the growing importance of the treatise in Western Christendom. Then, Leon Battista Alberti completes the cycle with his monumental study of the text, which serves as the basis for his famous treatise, De re aedificatoria. This scholar and great humanist is followed by Filarete, Francesco Colonna, Giovanni Santi, Francesco di Giorgio Martini, Grapaldi, the Hellenist Guglielmo Budé, Pomponio Gaurico, and Fabio Calvo Ravennate, who studies and translates the text for Raphael. Finally, the humanists and scholars, interested in Vitruvius's treatise, translate, interpret, and adapt it for publication. The first edition, folio-sized, lacks a title page and appears without a date or place of printing. However, it is known that around 1486, it was printed in Rome by the printer Giorgio Herolt.[21]

Giovanni Sulpicio da Veroli edited the Latin text for the Roman editio princeps of about 1486; he did not compose or translate Vitruvius's Latin. Editions followed at Florence in 1496 and Venice in 1497. Fra Giovanni Giocondo's illustrated Latin edition was printed at Venice by Giovanni Tacuino in 1511. Its woodcuts interpret the transmitted descriptions rather than reproduce an identifiable set of Vitruvius's original figures. Filippo Giunta issued the subsequent Florentine edition in 1513. These publications belong to the humanist editing and illustration of the ancient treatise.

And the sixth edition is the first in vernacular Italian, and its magnificent printing was carried out by Gotardo da Ponte in Como in 1521, based on a version by the Milanese Cesare Cesariano[22]. It is a great edition enriched with splendid woodcuts. With the mention of this beautiful edition,

21De re aedificatoria ('On the Art of Building') is Leon Battista Alberti's Latin architectural treatise in ten books, composed around the middle of the fifteenth century. Conceived in critical dialogue with Vitruvius, it is a foundational work of Renaissance architectural theory.

22Cesare di Lorenzo Cesariano, generally known as Cesare Cesariano (Milan, c. 1483–1543), was an architect, painter and architectural theorist. His illustrated Italian edition of Vitruvius, published at Como in 1521, played a central role in the Renaissance reception of De architectura. Vasari's biographical account must be assessed with the caution appropriate to that source.

the enumeration of the first printed versions of Vitruvius's treatise De architectura comes to an end.

Vitruvius's work, "De architectura," was published in printed editions after its manuscript. Among the printed editions, the following stand out:

Incunabula edition (editio princeps): The first printed edition of "De architectura" was published by Fra Giovanni Sulpitius in 1486. This edition was the original version, without illustrations. A second edition was published in 1495 or 1496.

Illustrated edition by Fra Giovanni Giocondo: Fra Giovanni Giocondo, a Dominican friar, produced the first illustrated edition with woodcuts in Venice in 1511. This edition featured magnificent illustrations and a meticulous philosophical approach.

Italian translations: Italian translations began to circulate in the 1520s. The first printed edition of an Italian translation, with new illustrations, was produced by Cesare Cesariano in Como in 1521. Cesariano was a friend of the architect Bramante.

Translations into other European languages: Vitruvius's work was quickly translated into other European languages. The first French version was published in 1547, and the first German version followed in 1548. The first Spanish translation was published in 1582 by Miguel de Urrea and Juan Gracián. The most authoritative and influential edition was published in French in 1673 by Claude Perrault, commissioned by Jean-Baptiste Colbert in 1664.

English adaptations and translations: John Shute based his book "The First and Chief Grounds of Architecture" on Vitruvius's text in 1563. Sir Henry Wotton published " The Elements of Architecture" in 1624, an adaptation heavily influenced by Vitruvius. The first complete English translation of the first five volumes was completed in 1771, and the entire work was published in 1791.

Later editions: Over the years, many later editions of "De architectura" were published, with detailed and interpretive illustrations. Vitruvius's work became a popular subject of hermeneutics thanks to printing and widespread dissemination.

Online edition: The 1914 edition of "De architectura" translated by Morris H. Morgan, Ph.D., is available in its entirety on Project Gutenberg and the Internet Archive. This edition has been an accessible resource for those interested in Vitruvius 's text.

These printed editions contributed to the dissemination and study of "De architectura" throughout history, and Vitruvius's work continued to influence architectural theory and practice throughout the centuries.

Vitruvius, Pollio (1914). The Ten Books on Architecture. Translated by Morgan, Morris Hicky. Illustrations prepared by Herbert Langford Warren.
Cambridge: Harvard University Press.

Krinsky, Carol Herselle (1967). "Seventy-Eight Vitruvius Manuscripts." Journal of the Warburg and Courtauld Institutes. The Warburg Institute. 30:36–70. doi:10.2307/750736. JSTOR 750736. S2CID 195019013.

The main theorist of architecture in the ancient classical age

The figure of Vitruvius [23]comes to us from the ancient tradition as the author of the greatest treatise on architecture, one of the few of a scientific and technical nature from Antiquity that survived the shipwreck of classic treatises of the ancient world, representative of the art of building and of the arcane tradition related to construction throughout the ages.

During the Middle Ages, Vitruvius's works were used to educate authors such as Boethius, Isidore of Seville, Hugh of Saint Victor, Gervaise of Melkley, Vincent of Beauvais, William of Malmesbury, Peter the Deacon, Albertus Magnus, and Jean de Montreuil, among others. Furthermore, medieval scholars like Theodoric of St. Trond and Hildegard of Bingen were influenced by his system of planimetry, based on the human figure, used as a construction module. Many memories of the great myths of the past are linked to Vitruvius's treatise on architecture. In his codex, one can read and rediscover Orpheus, Asclepius, Archimedes, Thales of Miletus, and Euclid, as well as learn

23**Marcus Vitruvius Pollio is the traditional form of the name of the Roman architect and author active in the first century BCE. His exact chronology remains uncertain; his career is generally placed between the late Republic and the early principate of Augustus.**

about myths such as that of Perdix, nephew of Daedalus, who invented the first compass.[24]

Vitruvius illustrates this point by naming those he considers the most talented individuals in history. Implicitly challenging the reader who has never heard of some of these people, Vitruvius goes on to predict that some of these individuals will be forgotten and their works lost, while other, less deserving political figures in history will be forever remembered with pomp.

Lists of notable men mentioned by Vitruvius in his treatise.

List of physicists: Thales, Democritus, Anaxagoras, Xenophanes.

List of philosophers: Socrates, Plato, Aristotle, Zeno, Epicurus.

List of kings: Croesus, Alexander, Darius

Regarding plagiarism: Aristophanes, King Ptolemy, a man named Attalus.

On the abuse of dead authors: Zoilus Homeromastix, Ptolemy II Philadelphus.

On the divergence of visual rays: Agatharchus, Aeschylus, Democritus, Anax agoras.

List of writers on temples: Silenus, Theodorus, Chersiphron and Metagenes, Ictinus and Carpion, Theodorus the Photius, Hermogenes, Arcesius, Satyrus and a man named Pytheos.

List of artists: Leochares, Bryaxis, Scopas, Praxiteles, Timotheos.

List of writers on the laws of symmetry: Nexaris, Theocydes, a person named Demophilus, Pollis, a person named Leonidas, Silanion, Melampus, Sarnacus, Euphranor.

24In Greek mythology, Perdix (Greek: Πέρδιξ) was the son of Daedalus's sister.

List of writers on machinery: Diades of Pella, Archytas, Archimedes, Ctesibius, Nymphodorus, Philo of Byzantium, Diphilus, Democles, Charias, Polyidus of Thessaly, Pyrrhus, Agesistratus.

List of writers on architecture: Fuficius, Terentius Varro, Publius Septimius (writer).

List of architects: Antistates, Callaeschrus, Antimachides, Pormus, Cossutius

List of the major architects of the temples: Chersiphron of Knossos, Metagenes, Demetrius, Paeonius of Miletus, Daphnis of Ephesus, Ictinus, Philo, Cossutius, Gaius Mucianus.

Vitruvius. The Ten Books on Architecture. Translated by Morris Hicky Morgan. Cambridge, MA: Harvard University Press, 1914, The Ten Books on Architecture. Courier Dover Publications. ISBN 0-486-20645-9.

Vitruvius's De architectura comprises ten books, each introduced by a preface. Their subjects are outlined below.

- Book I: In this book, Vitruvius addresses urban planning and architecture in general. He also focuses on the training and skills necessary to be an architect.
- Book II: Construction techniques and materials are discussed here, as well as the origin of architecture. Vitruvius explores the foundations of construction.
- Books III and IV: These books focus on temples and architectural orders. Vitruvius describes in detail the different architectural styles and how they are applied in temple construction.
- Book V: Vitruvius focuses on public buildings, with special emphasis on the forum, the basilica, and the theaters. He explains how these important public spaces are designed and constructed.
- Book VI: This book is dedicated to private constructions, including location, building typologies and aspects such as plasters and paving.
- Book VII: Vitruvius delves into the topic of coverings and decoration in this book. He describes how to decorate and embellish buildings, paying attention to decorative details.

- Book VIII: In this book, the author addresses hydraulics, including water supply systems and water-related technology.
- Book IX: Vitruvius makes an astronomical and astrological digression in this book, talking about sundials and other elements related to astronomy.
- X: The last book is dedicated to mechanics, including the construction of cranes, hydraulic machines and war machines. Vitruvius explores mechanical engineering in this chapter.

Accompanied Vitruvius's treatise have been lost. These drawings would have provided visual illustrations of the architectural and technical concepts described in the work. Despite the lack of illustrations, Vitruvius's "De architectura" remains a fundamental source for the study of architecture and engineering.

Little is known of Vitruvius's life beyond his own account. His service with military engines is attested in the dedication, but identification of his precise office as praefectus fabrum remains a historical hypothesis. The title means "prefect of the craftsmen"; its correct form does not prove that Vitruvius held the appointment.[25]

To contextualize Vitruvius' role as a military engineer, the following quote describes the "Prefect of the Field" or military engineer according to Flavius Vegetius Renatus in "The Military Institutions of the Romans":

The Camp Prefect, although of lower rank than the Prefect, held a position of considerable importance. He was in charge of the camp's location, the direction of the trenches, and the supervision of the soldiers' tents or huts and equipment. His authority extended to the sick and the doctors who cared for them, as well as regulating the corresponding expenses. He was responsible for providing wagons, latrines, and the appropriate tools for tasks such as sawing and cutting timber, digging trenches, constructing parapets, digging wells, and supplying water to the camp. He was also in charge of supplying the troops with timber and straw, as well as battering rams, onagris, ballistae, and other siege

25Fabrum is the genitive plural of faber, 'craftsman' or 'workman'; praefectus fabrum means 'prefect of the craftsmen/workmen', although the office's precise function depends on its historical setting. Latin forms require morphological analysis before translation and should not be treated as isolated lexical equivalents.

engines under his command. This position was always entrusted to an officer with great skill, experience and long service, capable of instructing others in the areas of the profession in which he had excelled.

Vitruvius, primarily known for his writings, was an architect. In ancient Rome, architecture encompassed a broader scope than it does today, including modern fields such as architecture, construction management, building engineering, chemical engineering, civil engineering, materials engineering, mechanical engineering, military engineering, and urban planning. Architectural engineers consider him the precursor of their discipline, formerly known as architectural engineering.

In his work describing the construction of military installations, he also addressed the miasma theory, maintaining that the unhealthy air of wetlands was the cause of disease. Vitruvius stated:

For fortified cities, the following general principles should be observed. First, a very healthy location must be chosen. This location should be elevated, free from fog and cold, in a temperate climate, and without nearby marshes. When morning breezes blow towards the city at dawn, if they bring with them fogs from the marshes and the poisonous breath of marsh creatures, these mixtures can enter the bodies of the inhabitants, making the place unhealthy. Furthermore, if the city is on the coast with exposure to the South or west, it will not be healthy, since in summer the southern sky heats up at dawn and is scorching at midday, while exposure to the West heats up after dawn and is hot at midday, and at nightfall everything glows.

Architecture in Vitruvius's time encompassed a broader field of study and disciplines then it does today, including construction management, chemical engineering, materials engineering, mechanics, and urban [26]planning. Frontinus mentions it in relation to the sizes of pipes used in Rome.

Vitruvius discusses the use of tuned bronze sounding vessels, echeia (ἠχεῖα), in theaters at 5.5. His dedication refers to benefits maintained through his sister's

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26**Sextus Julius Frontinus (c. 40–103 CE) was a Roman senator, consul and administrator. He is best known for De aquaeductu urbis Romae, his account of Rome's aqueducts and the administration of its water supply.**

recommendation (I, preface 2); it does not say that Octavia sponsored the sounding vessels, and the relevant preface is Book I rather than Book II.[27]

It is believed that he was born between 80 or 70 BCE and died after the year 15, data that are speculative but can be reconstructed from his own writings, thanks to the temples and Roman architectural works he mentions. "De architectura" is a monumental work and the only classical technical treatise that survived the Greco-Roman world.

Regarding the author's name, some scholars have suggested that it could be a symbolic name or epigraph, a practice documented in the ancient world. This study does not assume this hypothesis as established fact, but rather as an interpretive conjecture lacking direct documentary [28]confirmation.

Pythagoras of Samos (Greek: Πυθαγόρας; c. 570 BCE, Samos – c. 495 BCE, Metapontum) was the Greek mathematician and philosopher who founded the Pythagorean school. The agora (Ancient Greek: ἀγορά, agorá) was the central meeting place and marketplace in the cities of ancient Greece. From a symbolic interpretive perspective, some modern authors have pointed out possible resonances between elements of the name " Pythagoras " and mathematical concepts; however, these interpretations are not supported by established classical philology.

symbolic interpretive perspective — which the author of the source work develops in detail, albeit without support from conventional Latin philology — the full name " Marcus Vitruvius Pollio " (Marcus Vitruvius Pollio) could encode numerical and symbolic references if the Latin letters are read as numerals. These conjectures lack supporting historical documentation and should be read as the author's personal hermeneutical proposals, not as established facts.

27**Octavia the Younger (c. 69–11 BCE), Augustus's sister, should be distinguished from his elder half-sister, also named Octavia.**

28**Apuleius (Madaura, c. 125–after 170 CE), a Latin author from Roman North Africa, sometimes appears as Lucius Apuleius in the tradition. The praenomen Lucius is not securely established by ancient documentation and has been associated with the protagonist of the Metamorphoses, also known as The Golden Ass.**

His second name, " Polio, " has been known since ancient times to be a nickname. This can be read in Francesco Pellati's book, " Vitruvius, the Most Outstanding Treatise Writer on Architecture of Antiquity, " p. 30. Regarding the name Polion, given to Vitruvius by Faventinus, it can be hypothesized that it combined the architect's name with that of the founder of the world's first library in Rome, as Pliny states, who was " Asinius Pollio. " In this way, his name reflects an encyclopedic knowledge of architecture. It is interesting that the name Polion was chosen for his second name, from the Greek word *Biblos, meaning* " books," which signifies a scroll and was later translated as papyrus scroll and books.[29] [30] [31]

Regarding Asinius Pollio: It is true that Gaius Asinius Pollio, a prominent Roman orator, soldier, and writer of the 1st century BC, is known for having founded the first public library of the "Urbs" (city of Rome) in 39 BCE, located in the Atrium Libertatis. This library marked an important milestone in the history of public libraries in Rome.

Furthermore, Augustus, the first Roman emperor, also made significant contributions by fostering the development of libraries in the city. He founded a library attached to the Temple of Apollo on the Palatine Hill in 28 BCE and another, later, in the Campus Martius. These libraries provided access to a variety of texts and contributed to the flourishing of culture and education in Imperial Rome.

Throughout the Roman Empire, libraries continued to open in various locations, reflecting the importance placed on the preservation and dissemination of knowledge in Roman society. These libraries played a crucial

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29**Marcus Cetius Faventinus composed a practical architectural compendium drawing extensively on Vitruvius. The work is transmitted under titles including De diversis fabricis architectonicae and Artis architectonicae privatis usibus abbreviatus liber; the details of his biography and chronology remain uncertain.**

30**Pliny the Elder (23–79 CE) was a Roman writer, naturalist and military commander. He died during the eruption of Vesuvius in 79 CE. The exact calendar date of that eruption remains a separate historical question.**

31**Gaius Asinius Pollio, Asinius Pollio or Polio** (in Latin *Gaius Asinius Pollio* (75 BC – 4 AD) was a politician, orator, poet, playwright, literary critic, and historian of the early Roman Empire. His surviving writings served as material for Appian and Plutarch; Pollio was Virgil 's patron and a friend of Horace, and both poets dedicated poems to him.

role in the preservation of literature and the promotion of learning in ancient Rome.

The Greek word βιβλίον (biblion) means “book” or “roll”; βιβλιοθήκη (bibliotheke) means a place for books or a library. Biblion is the transliteration of βιβλίον; bibliotheke is a different word. In conventional Greek alphabetic numeration βίβλος totals 314, whereas βιβλίον totals 174. Any association of 314 with π belongs to the author’s symbolic interpretation and does not establish an ancient philological identification.[32]

The toponym Byblos (in Phoenician , Gubla, " mountain ") derived from the biblical name Gebal, which passed into the Greek form Byblos. From there comes the Greek word biblíon (" book ", originally « papyrus scroll »), origin of the terms " Bible " and " library ". The current Arabic name, Ŷ ubayl, is a diminutive of ŷ abal, " Mountain ". The first Christian Bible was written, according to tradition, on papyrus from this city.

The name Bible, by which the Christian holy book is known, is attributed to this city since the first Bible was made on papyrus from there.

Editor's interpretation (symbolic reading)

The division of De architectura into ten books is a fact of the textual tradition. Its interpretation as a symbolic structure associated with the Pythagorean tetraktys is the author’s hermeneutic proposal. Neither the number of books nor the comparison alone establishes a Vitruvian cosmological program. Historical transmission and symbolic interpretation should therefore be assessed separately.[33]

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32 Within the author’s geometrical interpretation, a cube viewed in perspective can produce a hexagonal outline and superimposed triangular figures resembling a hexagram. This proposed formal analogy is distinct from a documented historical account of the origin of the Star of David.

33 **The Tetractys** (Τετρακτύς in Greek) or *Tetorakutes* is a triangular figure consisting of ten dots arranged in four rows, with one, two, three, and four dots in each row. As a mystical symbol, it was very important to the Pythagoreans, representing a form of intellectual edifice. The numbers 6, 10, 16, and 216 were sacred within this school.

Before discussing the author's biography, a task almost impossible without the codex, it's worth noting that no documentary evidence of his life can be found, except for what he recounts in his own work. We can delve into this world of geometries and myths related to architecture through his prose, by reviewing his maxims and translating the prefaces to his books.

Proem to Book I

Latin text

Cum divina tua mens et numen, imperator Caesar, imperio potiretur orbis terrarum invictaque virtute cunctis hostibus stratis triumpho victoriaque tua cives gloriarentur et gentes omnes subactae tuum spectarent nutum populusque Romanus et senatus liberatus timore amplissimis tuis cogitationibus consiliisque gubernaretur, non audebam, tantis occupationibus, de architectura scripta et magnis cogitationibus explicata edere, metuens, ne non apto tempore interpellans subirem tui animi offensionem.

Cum vero attenderem te non solum de vita communi omnium curam publicaeque rei constitutione habere sed etiam de opportunitate publicorum aedificiorum, ut civitas per te non solum provinciis esset aucta, verum etiam ut maiestas imperii publicorum aedificiorum egregias haberet auctoritates, non putavi praetermittendum, quin primo quoque tempore de his rebus ea tibi ederem, ideo quod primum parenti tuo [de eo] fueram notus et eius virtutis studiosus. cum autem concilium caelestium in sedibus inmortalitatis eum dedicavisset et imperium parentis in tuam potestatem transtulisset, idem studium meum in eius memoria permanens in te contulit favorem. Itaque cum M. Aurelio et P. Minidio et Gn. Cornelio ad apparationem ballistarum et scorpionum reliquorumque tormentorum refectionem fui praesto et cum eis commoda accepi, quae, cum primo mihi tribuisti recognitionem, per sororis commendationem servasti.

Academic translation

When your divine mind and your inspiration, O Caesar Emperor, became masters of the empire of the world, and after all enemies had been vanquished by your invincible virtue, the citizens were glorified by your triumph and your victory, and all the subjugated nations awaited your design, and the Roman people and the Senate, freed from fear, allowed themselves to be governed by your profound thoughts and advice, I did not dare, before such high

occupations, to publish my writings on architecture, expounded with great reflections, fearing that, by interrupting you at an inopportune moment, I might incur your displeasure.

When I saw that your concern extended beyond the common life of all and the constitution of the state to the suitability of public buildings, so that the city's growth in provinces might be matched by public works worthy of imperial majesty, I thought I should publish these matters for you at the earliest opportunity. I had first been known to your father and devoted to his excellence; after he was received among the immortals and his authority passed into your power, my continuing devotion to his memory turned my loyalty towards you. Thus I served with Marcus Aurelius, Publius Minidius and Gnaeus Cornelius in preparing ballistae, scorpions and the other engines of war for use and repair, and received benefits with them. The benefits you first granted me you maintained, on review, through your sister's recommendation.[34][35]

Vitruvius Pollio, 1st century BC

Proem to Book II (The Complete Anecdote of Dinocrates)

Latin text

Dinocrates architectus cogitationibus et sollertia fretus, cum Alexander rerum potiretur, profectus est e Macedonia ad exercitum regiae cupidus commendationis. is e patria a propinquis et amicis tulit ad primos ordines et purpuratos litteras, ut aditus haberet faciliores, ab eisque exceptus humane petît, uti quamprimum ad Alexandrum perduceretur. cum polliciti essent, tardiores fuerunt idoneum tempus expectantes. itaque Dinocrates ab his se existimans ludi ab se petît praesidium. fuerat enim amplissima statura, facie grata, forma dignitateque summa. his igitur naturae muneribus confisus vestimenta posuit in hospitio et oleo corpus perunxit caputque coronavit populea fronde, laevum umerum pelle leonina texit, dextraque clavam tenens incessit contra tribunal regis ius dicentis. Novitas populum cum avertisset, conspexit eum Alexander.

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34 Publius Minidius is named among Vitruvius's colleagues in the preparation and repair of military engines (I, preface 2, in Krohn's text). He is not securely identified here with Publius Nonius Asprenas.

35 **Gnaeus Cornelius is named among Vitruvius's colleagues in the dedication (I, preface 2). The passage does not establish his identification with Gnaeus Cornelius Lentulus Clodianus.**

admirans ei iussit locum dari, ut accederet, interrogavitque, quis esset. at ille: 'Dinocrates', inquit, 'architectus Macedo, qui ad te cogitationes et formas adfero dignas tuae claritati. namque Athon montem formavi in statuae virilis figuram, cuius manu laeva designavi civitatis amplissimae moenia, dextera pateram, quae exciperet omnium fluminum, quae sunt in eo monte, aquam, ut inde in mare profunderetur'. Delectatus Alexander ratione formae statim quaesiit, si essent agri circa, qui possent frumentaria ratione eam civitatem tueri. cum invenisset non posse nisi transmarinis subvectionibus: 'Dinocrates', inquit, 'attendo egregiam formae compositionem et ea delector, sed animadverto, si qui deduxerit eo loci coloniam, fore ut iudicium eius vituperetur. ut enim natus infans sine nutricis lacte non potest ali neque ad vitae crescentis gradus perduci, sic civitas sine agris et eorum fructibus in moenibus affluentibus non potest crescere nec sine abundantia cibi frequentiam habere populumque sine copia tueri. itaque quemadmodum formationem puto probandam, sic iudico locum inprobandum; teque volo esse mecum, quod tua opera sum usurus'. Ex eo Dinocrates ab rege non discessit et in Aegyptum est eum persecutus. ibi Alexander cum animadvertisset portum naturaliter tutum, emporium egregium, campos circa totam Aegyptum frumentarios, inmanis fluminis Nili magnas utilitates, iussit eum suo nomine civitatem Alexandriam constituere. ita Dinocrates a facie dignitateque corporis commendatus ad eam nobilitatem pervenit. mihi autem, imperator, staturam non tribuit natura, faciem deformavit aetas, valetudo detraxit vires. itaque quoniam ab his praesidiis sum desertus, per auxilia scientiae scriptaque, ut spero, perveniam ad commendationem.

Vitruvius Pollio, 1st century BC

Academic translation

II.Pr.1 Dinocrates the architect, trusting in his ideas and ingenuity, left Macedonia for the army while Alexander was in power, eager to win the king's favor. He brought letters from relatives and friends at home to the leading officers and courtiers, hoping to gain easier access. They received him kindly, and he asked to be brought before Alexander as soon as possible. Although they promised to do so, they delayed while waiting for a suitable occasion. Thinking that they were making a fool of him, Dinocrates sought a resource within himself. He was very tall, with a pleasing face and an impressive, dignified physique. Trusting in these natural gifts, he left his clothes at the inn, anointed his body with oil, crowned his head with poplar leaves, draped a lion's skin over

his left shoulder and, holding a club in his right hand, advanced towards the tribunal where the king was administering justice. II.Pr.2 The unusual sight drew the crowd's attention, and Alexander saw him. Astonished, he ordered room to be made for him to approach and asked who he was. "Dinocrates," he replied, "a Macedonian architect, bringing you ideas and designs worthy of your glory. I have designed Mount Athos in the form of a male statue: in its left hand I have represented the walls of a very large city, and in its right a patera, a ritual bowl, to receive the water of all the mountain's rivers and pour it into the sea." II.Pr.3 Delighted by the account of the design, Alexander immediately asked whether there was farmland nearby capable of supplying the city with grain. Learning that it could be sustained only by supplies brought from overseas, he said: "Dinocrates, I appreciate the excellence of your design and take pleasure in it, but anyone who founded a colony there would, I see, be criticized for his judgment. Just as a newborn child cannot be nourished without its nurse's milk or develop through the stages of growing life, so a city cannot grow without farmland and its produce flowing into its walls, maintain a numerous population without abundant food, or sustain its people without supplies. I therefore approve the design but reject the site. Nevertheless, I want you to remain with me, for I shall make use of your services." II.Pr.4 From then on Dinocrates did not leave the king and followed him to Egypt. There, when Alexander had observed a naturally safe harbor, an excellent emporium, corn fields around the whole of Egypt, and the great benefits of the immense river Nile, he ordered him to found the city of Alexandria in his own name. Thus Dinocrates, commended by his face and dignity of body, attained that nobility. But to me, emperor, nature has not given stature, age has disfigured my face, and illness has sapped my strength. Therefore, since I am deserted by these protections , I hope to attain commendation through the aids of science and writings. [36][37]

36A **club** is a mace, cudgel, or club, usually made of wood, that increases in diameter from its handle to its end and which, since ancient times, has been used as a melee or contact weapon. The club, along with the lion skin, are attributes of Heracles (or Hercules) in Western art. In Buddhism, it is the weapon of the Dvarapalas. In the hands of Vishnu, it symbolizes primordial knowledge, and with Kali, it represents the power of time, which destroys all that opposes it.

37In Greek mythographical tradition Athos personifies the mountain of that name. The genealogies of personified mountains vary between sources and are not essential to the

Academic notes

This famous anecdote, located at the beginning of Book II, serves Vitruvius to contrast the figure of the ambitious and spectacular architect (Dinocrates) with his own physical modesty, presenting himself before Augustus solely with the value of his knowledge and his written work. It is one of the best-known and most frequently quoted passages in the treatise.

Reference:

Vitruvius, *De architectura* II, praef. 1–4.

Cf. Rowland and Howe (1999), pp. 35 –36; Krohn (1912), pp. 30–31.

According to legend, Alexander rejected the preliminary design of the city on Mount Athos because there was no water there.

Prologue to Book III (Extract)

Latin text

Nec tamen est admirandum, si propter ignotitiam artis virtutes obscurantur, sed maxime indignandum, cum etiam saepe eblandiatur gratia conviviorum a veris iudiciis falsam probationem. ergo, uti Socrati placuit, si ita sensus et sententiae scientiaeque disciplinis auctae perspicuae et perlucidae fuissent, non gratia neque ambitio valeret, sed si qui veris certisque laboribus doctrinarum pervenissent ad scientiam summam, eis ultro opera traderentur. quoniam autem ea non sunt inlustria neque apparentia in aspectu, ut putamus oportuisse, et animadverto potius indoctos quam doctos gratia superare, non esse certandum iudicans cum indoctis ambitione, potius his praeceptis editis ostendam nostrae scientiae virtutem.

Academic translation

It is no wonder that merit is obscured through ignorance of the art; but it is especially a cause for indignation when favor won at banquets often coaxes a false approval from true judgment. As Socrates wished, had perceptions, opinions and knowledge enriched by the disciplines been clear and transparent, neither favor nor ambition would prevail: works would be entrusted spontaneously to those who had attained the highest knowledge through genuine and sound scholarly labor. Since these things are neither manifest nor visible, as we think they ought to be, and I observe that the unlearned more often

architectural interpretation of Vitruvius's narrative.

surpass the learned through favor, I judge that I should not compete with the unlearned in ambition. I shall instead show the worth of our knowledge by publishing these precepts.

Proem to Book VI, 3–4

Latin Text (reference critical editions):

Epicurus vero non dissimiliter ait: pauca sapientibus fortunam tribuere, quae autem maxima et necessaria sunt, animi mentisque cogitationibus gubernari. haec ita etiam plures philosophi dixerunt. non minus poetae, qui antiquas comoedias graece scripserunt, easdem sententias versibus in scaena pronuntiaverunt, ut Crates, Chionides, Aristophanes, maxime etiam cum his Alexis, qui Athenienses ait oportere ideo laudari, quod omnium Graecorum leges cogunt parentes ⟨ali⟩ a liberis, Atheniensium non omnes nisi eos, qui liberos artibus erudissent. omnia enim munera fortunae cum dantur, ab ea faciliter adimuntur; disciplinae vero coniunctae cum animis nullo tempore deficiunt, sed permanent stabiliter ad summum exitum vitae.

Itaque ego maximas infinitasque parentibus ago atque habeo gratias, quod Atheniensium legem probantes me arte erudiendum curaverunt, et ea, quae non potest esse probata sine litteratura encyclioque doctrinarum omnium disciplina. cum ergo et parentium cura et praeceptorum doctrinis auctas haberem copias disciplinarum, philologis et philotechinis rebus commentariorumque scripturis me delectans eas possessiones animo paravi, e quibus haec est fructuum summa: nullas plus habendi esse necessitates eamque esse proprietatem, divitiarum maxime nihil desiderare. sed forte nonnulli haec levia iudicantes putant eos esse sapientes, qui pecunia sunt copiosi. itaque plerique ad id propositum contendentes audacia adhibita cum divitiis etiam notitiam sunt consecuti.

Academic translation

Epicurus likewise says that fortune grants the wise relatively little, whereas the greatest and most necessary matters are governed by thought and judgment. Many other philosophers held the same view. The authors of ancient Greek comedy — Crates, Chionides, Aristophanes and, above all, Alexis — expressed similar ideas on stage. Alexis praises the Athenians because, whereas Greek laws generally require children to support their parents, the Athenians impose that duty only in respect of parents who have taught their children an art. Fortune

may take away everything it has given; learning, once joined to the mind, remains steadfast to the end of life.

4. Therefore I owe the greatest and boundless gratitude to my parents, who, having approved the law of the Athenians, took care to educate me in art, and to teach me that which cannot be approved without literature and the encyclopedia of all doctrines. Therefore, since I had increased the wealth of disciplines by the care of my parents and the teachings of their precepts, I delighted myself in philological and philotechnical matters and commentaries, and prepared for myself those possessions of which this is the sum of the fruits, that there is no need to have anything more, and that it is the property of wealth above all, that I desire nothing. But perhaps some, judging these things to be trivial, think that those who are abundant in money are wise. Therefore, most of those striving for that purpose have acquired knowledge along with wealth by the use of daring.

1. Passage on the three parts of Architecture

Latin text

Partes ipsius architecturae sunt tres: aedificatio, gnomonice, machinatio.

Academic translation

There are three parts to architecture: building, gnomonics, and mechanics (machinatio).

2. Passage on the origin of Mechanics

Latin text

*4. Omnis autem est machinatio rerum natura procreata ac praeceptrice et magistra mundi versatione instituta. Namque animadvertamus primum et aspiciamus continentem solis, lunae, quinque etiam stellarum natura * * * machinata versarentur, non habuissemus interdum lucem nec fructûm maturitates. Cum ergo maiores haec ita esse animadvertissent, e rerum natura sumpserunt exempla et ea imitantes inducti rebus divinis commodas vitae perfecerunt explicationes. Itaque comparaverunt, ut essent expeditiora, alia machinis et earum versationibus, nonnulla organis, et ita quae animadverterunt ad usum utilia esse studiis, artibus, institutis, gradatim augenda doctrinis curaverunt.*

Academic translation

[4] All machinery originates in nature, with the revolution of the universe as its teacher and guide. We should first observe the continuous movement of the sun, the moon and the five planets. [...] The transmitted sentence is incomplete here; its surviving conclusion connects their motion with the light and ripening of crops available to us. Our predecessors observed these things, took examples from nature and, by imitating them under the guidance of celestial phenomena, developed devices useful in life. They made some tasks easier by machines and their rotations, others by instruments, and gradually improved what they found useful through study, craftsmanship, instruction and systematic knowledge.

3. Passage about unfortunate architects

Latin text

Maxime autem id animadvertere possumus ab antiquis statuariis et pictoribus, quod ex his, qui dignitatis notas et commendationis gratiam habuerunt, aeterna memoria ad posteritatem sunt permanentes, uti Myron, Polycletus, Phidias, Lysippus ceterique, qui nobilitatem ex arte sunt consecuti. namque ut civitatibus magnis aut regibus aut civibus nobilibus opera fecerunt, ita id sunt adepti. at qui non minore studio et ingenio sollertiaque fuerunt nobilibus et humili fortuna civibus non minus egregie perfecta fecerunt opera, nullam memoriam sunt adsecuti, quod hi non ab industria neque artis sollertia sed a felicitate fuerunt deserti, ut Hegias Atheniensis, Chion Corinthius, Myagrus Phocaeus, Pharax Ephesius, Boedas Byzantius etiamque alii plures. non minus item pictores, uti Aristomenes Thasius, Polycles et Androcydes ⟨Cyzice⟩ni, Theo Magnes ceterique, quos neque industria neque artis studium neque sollertia defecit, sed aut rei familiaris exiguitas aut inbecillitas fortunae seu in ambitione certationis contrariorum superatio obstitit eorum dignitati.

Academic translation

This can be seen above all in the sculptors and painters of old. Those who enjoyed marks of distinction and the favor of recommendation remain in everlasting memory among posterity—Myron, Polyclitus, Phidias, Lysippus and the others who won renown through their art. They achieved it because they made works for great cities, kings or noble citizens. Others, with no less zeal, talent and skill, made works no less admirably finished for citizens both noble and of modest means, yet obtained no remembrance: they were forsaken

not by diligence or artistic skill, but by good fortune. Such were Hegias of Athens, Chion of Corinth, Myagrus of Phocaea, Pharax of Ephesus, Boedas of Byzantium and many more. Likewise among painters there were Aristomenes of Thasos, Polycles and Androcydes of Cyzicus, Theon of Magnesia and the others, who lacked neither diligence, artistic commitment nor skill, but whose standing was obstructed by a small patrimony, adverse fortune or the superiority of rivals in the competition for distinction.

Recommended academic notes:

- The first passage comes from De architectura 1.3.1.
- The second passage, on mechanics and cosmic motion, belongs to Vitr. De arch. 10.1.4.
- The third appears in the context of talented architects who did not achieve success owing to misfortune.

Prologue to Book III

Comparative English paraphrases: III, preface 2, and VI, preface 3

For their works were not useless or without skill and talent, such as those of Hegias the Athenian, Chion the Corinthian, Myager the Phocian, Pharacus the Ephesian, Boedas the Byzantine, and many others. But the gifts of fortune are quickly won and as quickly lost; but teachings, once settled in the mind, never perish, but remain until the very end of life.

Academic translation

Nor was it that their works lacked usefulness, mastery, or talent, as was the case with Hegias of Athens, Chion of Corinth, Myagrus of Phocaea, Pharax of Ephesus, Boedas of Byzantium, and many others.

For the gifts that fortune bestows are quickly acquired and quickly lost; on the other hand, the disciplines of knowledge, once rooted in the spirit, never decline, but remain firm until the last day of our lives.

“Do not create superfluous needs: such is the most valuable property of wealth — to desire nothing.”

Greatest benefit is not creating needs, accepting that the greatest wealth consists of not desiring anything.

Vitruvius Pollio, 1st century BC

If, as Socrates intended, feelings, judgment, and doctrines nurtured in study were clearly manifested in the works of men, personal favors and machinations would be worthless... But since these qualities do not appear as clear as would be desirable, and we see that the ignorant are often more pleased with favor than the wise, I have decided to show, through the publication of these precepts, both my knowledge and my virtue.

And it is not that their works lacked utility, mastery, or talent, as was the case with Hegias of Athens, Chion of Corinth, Miagrus of Phocaea, Pharax of Ephesus, Boedas of Byzantium, and many others. For the gifts that fortune bestows are quickly acquired and quickly lost; on the other hand, the disciplines of knowledge, once rooted in the mind, never decline, but remain firm until the last day of our lives.

Prologue to Book VI (Extract)

Latin text

Aristippus philosophus Socraticus, naufragio cum eiectus ad Rhodiensium litus animadvertisset geometrica schemata descripta, exclamavisse ad comites ita dicitur: 'bene speremus! hominum enim vestigia video.' statimque in oppidum Rhodum contendit et recta gymnasium devenit, ibique de philosophia disputans muneribus est donatus, ut non tantum se ornaret, sed etiam eis, qui una fuerunt, et vestitum et cetera, quae opus essent ad victum, praestaret. cum autem eius comites in patriam reverti voluissent interrogarentque eum, quidnam vellet domum renuntiari, tunc ita mandavit dicere: eiusmodi possessiones et viatica liberis oportere parari, quae etiam e naufragio una possent enatare.

Academic translation

Aristippus, the Socratic philosopher, shipwrecked and cast ashore on the coast of Rhodes, noticed geometrical figures traced upon the sand, and is said to have cried out to his companions: “Let us be of good hope — for I see the traces of men.” He made at once for the town of Rhodes, went straight to the gymnasium, and there, discoursing on philosophy, was rewarded with such gifts

that he could furnish not only himself but also his companions with clothing and all else needful for living.[38][39]

40

Vitruvius Pollio, 1st century BC

Different translations of the treatise of Vitruvius throughout history

Note on the sources of the Latin text

The Latin passages of De architectura cited in this edition follow the critical text of Fritz Krohn (Vitruvii de architectura libri decem, Leipzig: Teubner, 1912), checked against Valentin Rose (1899) and the Budé volumes. Readings of Harleianus 2767 (British Library, Harley MS 2767), an important Carolingian witness dating to about AD 800, are reported from those editions unless direct inspection is explicitly documented. The surviving manuscript tradition cannot be reduced to this one witness.

Note on the book titles. It should be noted that the manuscripts transmit no thematic titles for the ten books. The tradition —headed by the Harleianus 2767 (H)— records only the formula 'Liber primus explicit, incipit liber secundus' (H alone adding 'deo gratias amen'); of the rubrics or capitula, only those of Book I survive. Accordingly, the descriptive Latin titles that head each book in this edition (De aedium sacrarum symmetria, De ordinibus architectonicis, De gnomonica, and so on) are neither Vitruvius's nor the manuscripts', but modern editorial conventions, coined in the tradition of Rose, Krohn, and the Budé and adopted here to orient the reader; their content

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38**Aristippus of Cyrene, active in the fifth and fourth centuries BCE, was a Greek philosopher associated with Socrates and the Cyrenaic tradition, which gave pleasure a central place in ethical reflection.**

39In the Greek world the gymnasion (γυμνάσιον) was an institution for physical exercise and, increasingly, for educational and intellectual activities. Its name is related to γυμνός, 'naked'.

40Books of interest on Vitruvian topics, Francesco Pellati, " Vitruvius the great architect of Greco-Roman antiquity" Clot Publishing House, Buenos Aires 1944, the Website, Arqweb.com, Author Architect Carlos Zanchez Montana, Spain and the Spanish translation of the Treatise " On Architecture " "The 10 books of architecture of Vitruvius, by Don Joseph Ortiz y Sanz Royal Printing House year 1799.

rests on the summaries Vitruvius himself gives at the end of each book. They are therefore retained as editorial conveniences, not attributed to the ancient text.

The principal witnesses distinguished by Krohn are Harley MS 2767 (H), the Selestadiensis (S), Gudianus 132 (E), and Gudianus 69 (G). E preserves excerpts interspersed with Faventinus, whereas G contains the full treatise. Their shelfmarks, dates, and editorial groupings are set out in Table 9. Giovanni Sulpicio da Veroli prepared the first printed edition, published in Rome in the 1480s.

The English translation in this volume derives from Diego Kurilo's original Spanish rendering made directly from the Latin. The Spanish edition is therefore the primary authorial reference for sense and interpretation, with the Latin controlling doubtful readings. Rowland and Howe (1999), Fensterbusch (1964) and Ortiz y Sanz (1787) are comparative aids, not the source of the English translation or substitutes for the author's Spanish text.

Codicological note. The principal witness is conventionally designated Harleianus 2767 (British Library, Harley MS 2767): the oldest and most authoritative codex for the constitution of the Vitruvian text is, indeed, Harleianus *2767*. Cf. LD Reynolds (ed.), *Texts and Transmission: A Survey of the Latin Classics* (Oxford: Clarendon Press, 1983), pp. 440–445.

The rediscovery and dissemination of Vitruvius's treatise during the Renaissance owes much to the work of humanists such as Poggio Bracciolini and Leon Battista Alberti, who extensively incorporated its principles into his seminal work, *De re aedificatoria* (c. 1450). The *editio princeps* appeared in Rome in 1486 under the supervision of Giovanni Sulpicio de Veroli. Subsequent translations were made into the major European languages: Italian (Cesare Cesariano, 1521), French (Jean Martin, 1547; Claude Perrault, 1673), German (Walther Hermann Ryff, 1548), and Spanish (José Ortiz y Sanz, 1787), among others. Since the original illustrations have not survived, the first illustrated edition was published in Venice in 1511, with woodcuts probably executed under the supervision of Fra Giovanni Giocondo. Later, in the 16th century, Andrea Palladio provided illustrations for Daniele Barbaro's

commentaries. However, the most famous image inspired by Vitruvius remains Leonardo da Vinci's *Vitruvian Man* (c. 1490).[41][42][43]

41In Milan, he met Donato Bramante, according to the life of Bramante written by Giorgio Vasari, who narrates an as yet unproven interview with Cesarino: " Determined [Bramante] to see at least something remarkable, he moved to Milan to see the cathedral, where there was a certain **Cesare Cesarino**, reputed, a good geometer as an architect. "

42**Fra Giovanni Giocondo (Verona, c. 1433–Rome, 1515) was a humanist, architect and editor of ancient texts. His illustrated edition of Vitruvius, published at Venice in 1511, is a landmark in the printed transmission of De architectura.**

43 On the lost schemata. The drawings mentioned by Vitruvius do not survive as a complete identifiable authorial set; this does not establish when each was lost. Giocondo's edition of 1511 and Palladio's illustrations for Barbaro (1556) belong to Renaissance reconstruction. See F. Lemerle, "M. Vitruvius per Jocundum", and the Barbaro 1556 notice, Architectura (CESR, Tours). Volumen is translated "book" for divisions of the treatise; "scroll" denotes the material roll, whose support was not necessarily papyrus.



Figure 4. The Quiroga Christogram, fifth century CE. Inscribed marble disk, approximately 95 cm in diameter. Museo Diocesano e Catedralicio de Lugo, Spain. Reproduction supplied for this edition; object identification follows the Diputación de Lugo's museum documentation.[44]

The association between later Christian monograms, architectural order and felicitas is the author's interpretive comparison. It requires its own documentary support and is distinct from establishing the wording of Vitruvius.[45][46]

"Avrvm vile tibi est argenti pondera cedant"
"Gold is of little worth to you; let the weight of silver yield. What matters more is that you shine with your own felicity."[47]

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44 Diputación de Lugo, "Crismón de Quiroga: testigo del primer cristianismo en Galicia," https://turismo.deputacionlugo.gal/es/conece/lugoinedito/crismon (accessed October 25, 2026). The institutional description identifies a fifth-century marble disk, approximately 95 cm in diameter, preserved in the Museo Diocesano of Lugo Cathedral.

45 The compositional element architect-/archi- derives, through Latin architectus, from Greek ἀρχιτέκτων (architektōn), formed from ἀρχι- ('chief', 'principal') and τέκτων ('builder', 'craftsman'). It does not mean 'the first cause of construction' in a philological sense. The symbolic connection with arkhē proposed in the present work belongs to the author's hermeneutic interpretation.

46 The association of architectural felicitas with the architect's apotheosis belongs to the symbolic interpretation proposed in this work. Latin felicitas denotes happiness, good fortune or success; felicitate is an inflected form, not its dictionary lemma.

47 Quiroga inscription. Avrvm retains V for U; normalized: Aurum vile tibi est, argenti pondera cedant; plus est quod propria felicitate nites. Felicitas means felicity or blessedness, not wisdom. This is a normalized reading, not a new diplomatic transcription. See Xunta de Galicia, DOG 246 (29 December 2017), Ribeira Sacra resolution, Quiroga; Deputación de Lugo, "Crismón de Quiroga". Its use here is the author's symbolic comparison.

There is a story and a certain mythology associated with Archimedes [48]that Vitruvius mentions in his book about the discovery of the principle that bears his name. Legend has it that the genius from Syracuse uttered the word Eureka [49](today synonymous with achievements of all kinds) when he entered his bathtub and realized that the volume of water displaced fell over the circular edge of the tub. This displacement was equal to the volume of his body. In this way, he created the theoretical basis for what later became known as Archimedes Principle.This principle describes:

A body wholly or partly immersed in a fluid at rest experiences an upward buoyant force equal to the weight of the fluid it displaces. Vitruvius's anecdote concerns displaced volume and the composition of a crown; it does not formulate the modern law of buoyancy in these terms.

Vitruvius recounts how King Hiero of Syracuse suspected that silver had been substituted for some of the gold supplied for a votive crown. He asked Archimedes to investigate the suspected fraud. While entering a bath, Archimedes noticed that the water displaced corresponded to the volume of his submerged body. The account then describes comparative tests with equal weights of gold, silver and the crown. The details about sleepless nights and advice from his wife do not occur in Vitruvius's narrative and should not be treated as part of his testimony.

48**Archimedes of Syracuse** (in ancient Greek) Ἀρχιμήδης (Syracuse (Sicily), ca. 287 BC – ibid., ca. 212 BC) was a Greek physicist, engineer, inventor, astronomer and mathematician.

49***Εὕρηκα (heūrēka), 'I have found it', is the exclamation traditionally associated with Archimedes in the story of the crown. The narrative belongs to the later biographical tradition.***

The famous **story of Archimedes** (the " Eureka!" episode and the golden crown of King Hiero II) appears in:

De architectura, Book IX, Preface (IX, praef. 9–12)

Context:

Vitruvius recounts it in the **prologue to Book IX**, dedicated to astronomy, gnomonics, and mathematics. He uses this anecdote to illustrate the importance of ingenuity (*ingenium*) and theoretical reasoning (*ratiocinatio*) in scientific and technical disciplines.

Passage summary:

Vitruvius recounts how King Hiero suspected that a craftsman had mixed silver into the gold of a votive crown. Archimedes investigated the fraud by comparing the water displaced by the crown with that displaced by equal weights of gold and silver. The bath episode introduces the principle of displaced volume in the narrative; it should be distinguished from a formal statement of the modern law of buoyancy. Vitruvius reports that Archimedes ran home naked, repeatedly crying εὕρηκα, “I have found it”.

Exact quote (academic translation):

" Archimedes, while in the bath, noticed that the water overflowing from the tub was equal in volume to his submerged body. From this fact he deduced the method to solve the problem..."

(De architectura IX, praef. 10)

Location summary:

- **Book:** IX (ninth book)
- **Section:** Preface (introduction) to Book IX
- **Paragraphs:** Mainly 9 to 12

Today we know that the technical engineering necessary at that time to measure the displacement of an irregular volume in water had not yet been invented. Galileo himself[50], centuries later, pondered these questions, creating a

50A **hydrostatic balance is an experimental** device used to study the buoyant force exerted by fluids on bodies immersed in them. It was invented by Galileo Galilei on December 17, 1585. Its operation is based on Archimedes ' principle and it is specifically designed for determining the densities of solids and liquids.

model of a hydrostatic balance with sufficient precision to carry out such a measurement.

The anecdote of the discovery of Archimedes' principle, as narrated by Vitruvius (De architectura 9, praef. 9–12), has an illustrative and didactic character. From a historical-scientific perspective, the account has been the subject of debate: modern researchers have pointed out that the technique described for measuring the displacement of irregular volumes would not have been possible with the means available at the time. Vitruvius' account should therefore be read as an exemplary anecdote rather than as precise technical documentation.

Archimedes (c. 287–212 BCE) was the first known mathematician to use regular n-sided polygons as a method of approximating the number π by both underestimation and overestimation. Starting with hexagons inscribed and circumscribed about circles and progressively doubling the number of sides until reaching 96-sided polygons, he obtained the value $3 < \pi < 3\ 1/7$ (approximately 3.1416). This method, known as the " method of exhaustion, " is one of the most significant mathematical achievements of antiquity.[51]

The Eureka anecdote concerns the principle of buoyancy, not the value of π. The calculation of π by means of inscribed and circumscribed polygons is a separate achievement, set forth in his treatise Measurement of the Circle (Περὶ κύκλου μέτρησις), where he bounds π between 3.1408 and 3.1428 using polygons of up to 96 sides.

Treatise: *Measurement of the Circle* (Περὶ κύκλου μέτρησις)

- **Author:** Archimedes of Syracuse
- Date of composition: End of the 3rd century BC. C., approximately between 250 BCE. C. and 212 BCE. c.

Chronological details:

- It is believed to have been written during Archimedes' mature period, probably between 240 and 220 BCE.

51**Archimedes of Syracuse (Greek Ἀρχιμήδης; Syracuse, Sicily, c. 287–c. 212 BCE) was a Greek mathematician, engineer, inventor and astronomer. Although few details of his life are securely known, his surviving writings and the ancient testimonia establish his central place in the history of Greek mathematics and mechanics.**

- It is one of his later works within his preserved mathematical production.
- Archimedes died in 212 BCE during the Roman conquest of Syracuse, so all his works predate that date.

Historical context:
This treatise is relatively short but of enormous importance, since Archimedes manages to limit the value of **π** between **3.1408** and **3.1429** by means of the method of inscription **and circumscription of regular polygons (**reaching up to the 96-sided polygon).

It is one of the most influential works of ancient mathematics in the calculation of π.

Treatise Measurement of the Circle (Περὶ κύκλου μέτρησις) was composed in Syracuse during the second half of the 3rd century BC, probably between 240 and 220 BCE. In it, the Greek mathematician first establishes rigorous limits for the value of π by means of the exhaustive method of inscribed and circumscribed polygons.

The name Ἀρχιμήδης (Archimedes) is usually analyzed as ἀρχι- (arkhi-, "chief, master") with the root of μήδομαι (mḗdomai, "to devise, to contrive"), hence approximately "master of devising." From a symbolic interpretive perspective, the author of the source work proposes a particular semantic breakdown of the name; this proposal is a personal reading that does not reflect the consensus of Greek linguistics. What can be stated with certainty is that the proper name Archimedes was common in the Greek world and does not necessarily carry a technical-architectural meaning.

Cicero He describes the tomb of Archimedes that he had visited and indicates that on it was a sphere inscribed within a cylinder. Archimedes had proven that the volume and the area of the sphere is two-thirds that of the cylinder that inscribes it, including its bases, which was considered the greatest of his mathematical discoveries.

Cicero visited Archimedes' tomb in Syracuse around 75 BCE and described it in his Tusculan Disputations (V, 64-66).

- On the tomb there was a **sphere inscribed in a cylinder**, just as Archimedes had requested.

• Archimedes considered this discovery one of his greatest achievements: the volume of a sphere is exactly 2/3 the volume of the cylinder that circumscribes it (including the bases). He also demonstrated the same for surface areas.

This is historically accurate and well documented.
Cicero explicitly mentions the sphere and the cylinder.
Cicero, during his visit to Syracuse, described the tomb of Archimedes, upon which, as the mathematician himself had requested, stood a **sphere inscribed in a cylinder**. This monument commemorated one of his greatest discoveries: that both the **volume** and **surface area of** a sphere are equal to **two-thirds** of those of the circumscribed cylinder (including its bases). Archimedes considered this result one of his most important achievements.

Analysis of the name Pitágoras (Πυθαγόρας):
Accepted academic etymology:

• **Πυθ-** (Pyth-) → comes from **Πυθώ** (Pyth ṓ), ancient name of Delphi, the sanctuary of Apollo. It is related to the snake **Python** (Πύθων) that Apollo killed.

• **-αγόρας** (-agoras) → **derives** from **ἀγορά** (agorá), which means **assembly**, **public meeting**, **square**.

Most widely accepted traditional meaning:
"The one who speaks in the assembly at Pytho (Delphi)"
either
"The Pythian orator" / "The one who announces at Delphi"
That is, it refers to someone related to the oracle of Delphi or to the Apollonian cult.

Ovid's Metamorphoses, Book VIII

As he placed his unfortunate son's body upon the mound, a partridge, from a damp oak tree, watched him, chattering and beating its wings, its song expressing its joy. It was then the only bird of its kind, never before seen. And newly transformed into a bird, it was for you, Daedalus, a long crime.

This boy, unaware of his destiny, had been entrusted to his sister for instruction: a twelve-year-old child, quick-witted and capable of learning. Observing the spines protruding from the back of a fish, he used them as a model and, carving continuous teeth into a sharp piece of iron, invented the use of the saw. He was

also the first to join two iron arms with a single knot, so that, maintaining an equal distance, one remained stationary while the other traced a circle.

Daedalus, envious, threw him from Minerva's sacred precinct, pretending he had slipped. But Pallas, protector of cleverness, caught him and transformed him into a bird: she covered half his body with feathers and turned him into a partridge. However, the vigor of his former wit passed to his wings and feet, preserving his swiftness.

> The name, which also before, remained.

No, even so, this one does not raise its body high nor make its nests in the branches and the high treetop. It flutters close to the ground and lays its eggs in the hedges, and, remembering its ancient fall, it is afraid of heights.

Details:

- The story of **Daedalus throwing his nephew Perdix** (or Talos) from the temple of Minerva and the transformation of the latter into a partridge is a mythological tale **that** *comes mainly from Ovid, Metamorphoses***,** Book **VIII,** verses **236–259**.
- **Vitruvius** mentions **Daedalus** in his treatise, but only very briefly and without any connection to this dramatic anecdote. He cites **him** in:
    - **Book VII, Preface** (when speaking of ancient inventors in the arts).
- He mentions him as a great architect of the past, along with other legendary names, but without telling the story of envy, murder, or the partridge.

Vitruvius uses Daedalus as an example of an ancient inventor, but **he does not narrate the myth of Perdix**.

" The mythographic tradition, collected by Ovid in the Metamorphoses (VIII, 236–259), narrates that Daedalus, moved by envy, threw his nephew Perdix from the temple of Minerva..."

Vitruvius mentions Daedalus in the Preface to Book VII of *De architectura*.

Exact location:

- Book VII, Preface, section 1 (VII, praef. 1)

Context and quote:
Vitruvius mentions him while discussing ancient inventors and artists who contributed to the progress of the arts but often did not receive the recognition they deserved. He cites him alongside other legendary names:

«...uti Daedalus, Theodorus, Rhoecus, Phileas, Archytas, et alii plures... »
(Among many others such as Daedalus, Theodore, Rochus, Phileas, Archytas...)
Meaning in context:
Vitruvius uses Daedalus as an example of a great inventor and craftsman of Antiquity, representing the quintessential mythical architect. However, he does not recount the story of Daedalus's envy of his nephew Perdix or his transformation into a partridge (that story belongs exclusively to Ovid).

The Metamorphoses (Book VIII, 157–182)

"The shame of his generation had grown, and the adultery of that mother was shamefully revealed by the novelty of the two-faced monster. Minos decided to suppress this shame from his bridal chamber and confine it within a multi-tiered house and blind ceilings. Daedalus, celebrated for his talent in the art of construction, undertook the work, confusing the signs and leading the eye through the crooked detour of its varied passages. Just as the Phrygian Meander plays in the clear waves, with its ambiguous course ebbing and flowing, and, rushing to meet them, gazes upon the waves that are to come, and turning now towards its sources, now towards the open sea, exhausts its uncertain waters: so Daedalus filled his innumerable passages with error, and he himself could scarcely return to the threshold; so great was the fallacy of that roof."

In it, after the twin figure of bull and youth was imprisoned, and the monster, twice fed with Athena's blood, was subdued by the third lot, repeated at nine years; and when, with virginal help, that difficult door was found—something not achieved by any of the previous ones—thanks to the thread gathered, at once the Aegis, having abducted the Minoan, set sail for Dia and on that shore cruelly abandoned his companion.

To her, abandoned and lamenting many things, Liber offered his embraces and his help; and so that she might be a perpetual bright star, he took his crown from her brow and sent it to the sky. It flies through the faint breezes, and as it flies,

its gems turn into clear fires and come to rest, retaining the appearance of a crown, in the place between the one who rests on her knee and the one who holds the serpent."

Note on the mythological reference: "While Vitruvius's treatise, *De architectura*, focuses on the rigor of technique and ratiocinatio, it is essential for the historian of architecture to consult contemporary literary sources to understand the archetype of the 'craftsman.' In this sense, Ovid's description in Book VIII of *Metamorphoses of* Daedalus 's labyrinth — the primordial figure of the builder — offers an unparalleled metaphor for spatial complexity. Ovid's text, in narrating how the craftsman 'disturbs the signs' and 'wears out its uncertain waters,' not only recounts a myth but also defines the fundamental challenge of architecture: the human capacity to impose a rational order (*ichnographia*) upon nature, even when that very creation, like the labyrinth, possesses its own enigmatic fallacy. "

The Metamorphoses (Book VIII, 183–216)

Daedalus, meanwhile, hating his long stay in Crete and his exile, and yearning for his homeland, found himself confined by the sea. " Though Minos closes the lands and the waves," he said, "the sky is certainly open; through it we shall go. He may possess everything, but he does not possess the air." Having said this, he turned his mind to unknown arts, innovating upon nature.

He arranged some feathers, starting with the smallest and continuing with longer ones, so that they appeared to grow in a slope; this is how the rustic syrinx gradually emerged with its uneven feathers. Then, he joined the middle ones with linen and the lower ones with wax, and, once they were arranged with a slight curve, he bent them to imitate real birds.

The boy Icarus stood beside him, unaware that it was his own danger, and whether with a radiant face, as he tried to grasp the feathers that the breeze stirred, or softening the golden wax with his thumb, he hampered his father's admirable work with his games. After putting the finishing touches on his project, the craftsman balanced his own body on his twin wings and remained suspended in the air that he himself moved. He also instructed his son: "I warn you, Icarus, to fly only halfway; if you fly too low, the weight of the sea will weigh down your feathers, and if you fly too high, the fire will scorch them. Fly

between these two extremes. Do not look to the Boötes, nor to the Great Bear, nor to Orion's sword; follow me as your guide."

At the same time, he imparted to him the precepts of flight and adjusted the unfamiliar wings to his shoulders. Between this task and the advice, his aged cheeks grew moist and his fatherly hands trembled. He kissed his son, the last he would ever give him, and, rising on his wings, flew ahead, fearing for his companion, like the bird that urges its tender young from the nest into the air and exhorts them to follow, instructing them in perilous arts. He too moves his own wings and looks back to see his son's.

Some fisherman, while trying to catch fish with his trembling rod, a shepherd leaning on his staff, or a farmer on his plough, saw them and were astounded, believing that those who could command the ether were gods.

"Daedalus in the Classical Imagination: A Literary Digression " Although Vitruvius omits the mythical account of the escape from Crete in his technical treatise, the figure of Daedalus — architect of the labyrinth and craftsman of the wings — permeated Roman thought as the paradigm of the builder. What follows is Ovid's famous recreation in *Metamorphoses* (Book VIII), which illustrates the poetic dimension of the craftsman who, like the Vitruvian architect, must master both matter and air.

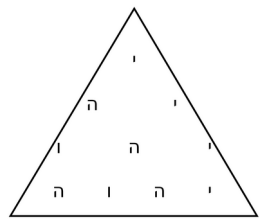


Figure 5. The Tetragrammaton arranged as a tetraktys. Editorial redrawing of the same ten-letter diagram, after AnonMoos (2005), Tetragrammaton-Tetractys.png, Wikimedia Commons (public domain). This symbolic comparison is the author's interpretation; Vitruvius does not name the tetraktys or transmit this diagram.

The tetraktys (τετρακτύς) is, in the Pythagorean tradition, the triangular figure of the number ten (1 + 2 + 3 + 4 = 10), a symbol central to the school's theory of number. Vitruvius does not name it; it is recalled here only to situate the Pythagorean background against which his occasional references to number and proportion may be read.

The presence of Pythagoras in Vitruvius: Vitruvius does acknowledge the Pythagorean influence on the theory of music and proportion. When Vitruvius speaks of harmony and mathematical ratios (such as the proportions that temples or the human body should maintain), he is operating under the same theoretical framework as the Pythagoreans. However, he does so through technical terms from architecture and geometry (such as module, ratio, proportion), not through the numerical mysticism characteristic *of* the Pythagorean sect.

Although Vitruvius does not cite the tetraktys, modern commentators on De architectura sometimes invoke it to describe the logic of his proportional ratios. Such readings belong to the interpretive literature rather than to Vitruvius's own statements, and are reported here as that.

Difference in approach: Vitruvius is a technician and engineer who writes from a practical and pragmatic perspective for a Roman professional audience. The *tetractys* belongs to a more esoteric and metaphysical realm of Greek philosophy, a field that Vitruvius prefers to set aside in favor of the constructive applications of geometry.[52]

The devir and the holy of holies

A current of Pythagorean origin in Greco-Roman thought associated number, and the cube in particular, with order; within it the number 216 (6^3) carried weight as the cube of the "perfect number" six. Vitruvius alludes to this background in the preface to Book V, but his own use of it is technical, as the following paragraphs show.

Vitruvius alludes to this tradition in the preface to Book V, where he remarks upon the standing of Pythagorean doctrine in the formation of the architect. His own concern, however, is technical: he invokes the Pythagorean "cubic ratio" of 216 as an analogy for the orderly compilation of knowledge, not as a hidden structural key to the treatise.

52 The **Tetraktys** (Τετρακτύς in Greek) is a triangular figure consisting of ten points arranged in four rows, with one, two, three and four points in each row.

It is in this context that Vitruvius's reference in the preface to Book V should be read:

" [The ancients] established that the cubic ratio is equal to 216 units. "

Vitruvius's point here is methodological rather than mystical: just as the Pythagoreans found completeness in the cube of six ($6^3 = 216$), so he claims to have gathered the scattered teachings of his predecessors into a single, ordered body of doctrine.

Original reference: *De architectura*, V, Praefatio, 1

Latin text:

Non minus cum animadvertissem distentam occupationibus civitatem publicis et privatis negotiis, paucis iudicavi scribendum, uti angusto spatio vacuitatis ea legentes breviter percipere possent. Etiamque Pythagorae quique eius haeresim fuerunt secuti, placuit cybicis rationibus praecepta in voluminibus scribere, constitueruntque cybum CCXVI versus eosque non plus tres in una conscriptione oportere esse putaverunt. Cybus autem est corpus ex lateribus aequali latitudine planitiarum perquadratum. is cum est iactus, quam in partem incubuit, dum est intactus, inmotam habet stabilitatem, uti sunt etiam tesserae, quas in alveo ludentes iaciunt. hanc autem similitudinem ex eo sumpsisse videntur, quod is numerus versuum, uti cybus, in quemcumque sensum insederit, inmotam efficiat ibi memoriae stabilitatem. graeci quoque poetae comici interponentes e choro canticum diviserunt spatia fabularum. ita partes cybica ratione facientes intercapedinibus levant actorum pronuntiationes.

3. Not least, when I had observed that the city was busy with public and private affairs, I judged it necessary to write it in a few words, so that those who read it in the brief span of their leisure might grasp it quickly. Even Pythagoras and those who followed his school decided to write the precepts in volumes for the sake of cubic reasoning, and they established a cube of 216 verses, and they thought that no more than three of them should be written in one collection. 4. A cube is a body with sides of equal width, divided by planes. When it is

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53**Fiat lux** is a Latin phrase that literally means *"Let there be light"* or *"Let there be light*," and has its origins in the Hebrew phrase יְהִיאוֹר (yehiy 'or).

The expression comes from the third biblical verse of the book of Genesis.

thrown, it has an unshakeable stability on whichever side it falls on, as long as it is intact, just as the dice are also the ones that players throw into a bowl. They seem to have taken this similarity from the fact that the number of lines, like a cube, which has settled in any sense, creates an unshakeable stability of the memory there. The Greek comic poets also, interposing songs from the chorus, divided the spaces of their fables. Thus, making the parts in a cubical manner, they lift the utterances of the acts with the interstices.

Translation

"Therefore, observing that this discipline has arisen from countless authors, I did not consider it shameful for me to compile what each of them had written and reduce it to a single body. [...] And just as the Pythagoreans, in writing about the nature of things, established that the cubic ratio equals 216 units — a number which, in my opinion, seems to correspond to the constitution of the whole world — so too have I reduced to a single body what has been transmitted by authors on architecture."

Notes for the academic edition:

1. **Philological observation:** It is important to note that Vitruvius uses the expression *cubica ratione* (cubic ratio) to refer to the cube of the number 6 ($6 \times 6 \times 6 = 216$). In the Pythagorean tradition, 6 is a "perfect number" (because it is equal to the sum of its divisors: 1+2+3=6), and its cubing represents spatial solidity and cosmic harmony.
2. **Context:** Vitruvius uses this analogy to justify his own work as a compiler: just as the Pythagoreans sought universal harmony through the number 216, he seeks "technical harmony " by condensing the scattered knowledge of ancient architects into his own work.

Note:

Vitruvius discusses the number 216 in De architectura 5.praef.3–4. Krohn (1912, 94–95) prints: “Etiamque Pythagorae quique eius haeresim fuerunt secuti, placuit cybicis rationibus praecepta in voluminibus scribere, constitueruntque cybum CCXVI versus eosque non plus tres in una conscriptione oportere esse putaverunt.” In English: “Pythagoras and those who followed his school also chose to set down their precepts in books according to cubic principles: they made a ‘cube’ consist of 216 verses and thought that no more than three such units should be included in a single

composition." In the next paragraph the stability of a thrown cube explains the analogy with retention in memory. A proposed connection with the constitution of the cosmos belongs to the author's hermeneutic interpretation; it is not a statement made in the quoted Latin.

"This philosophical doctrine was articulated as an intellectual support for the development of knowledge, materializing both in the configuration of architectural spaces and in the expository structure of the treatises. From a hermeneutical perspective, this edition proposes that *De architectura* can be interpreted as an 'intellectual edifice' in whose organization lie coded numerical values of Pythagorean origin."

In this respect, the Pantheon is the only building from Antiquity whose architecture materializes a cosmic sphere resting on the earth. The *coffered ceiling* of the dome, similar to a crystalline structure, channels the light from the oculus onto the checkerboard floor, generating a mirrored geometry where the light not only illuminates the space but also reveals the mathematical order of the cosmos.

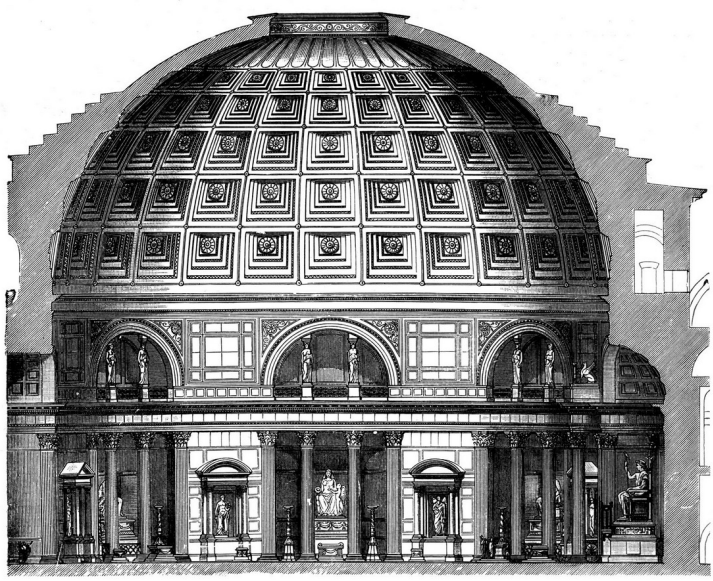


Figure 6. Cutaway illustration of the Pantheon at Rome, from the illustrative material supplied for this edition. The surviving rotunda belongs to the Hadrianic rebuilding, not Agrippa's original structure. The image is used as a comparative visualization, not as a figure transmitted with De architectura.

Longitudinal section of the Pantheon at Rome; the standing building belongs to a later imperial reconstruction.[54]

The Pantheon in its Hadrianic form postdates De architectura. Its circular plan and elevation nevertheless invite comparison with the proportional principles discussed in the treatise. In the interpretation proposed here, the building develops an architecture that takes human measure as a point of reference; this is a comparative reading, not evidence that Vitruvius designed its proportions.

Vitruvius discusses the proportional relation of parts to a whole through symmetria and the harmonious appearance of a composition through eurythmia. The Pantheon may be read in this light: its interior height to the top of the dome approximately equals its internal diameter, allowing an imagined sphere within the space. The relevant height is that of the whole interior, not merely the cylindrical drum. Any association with the Vitruvian Man remains a comparative interpretation.

This comparison shows how a system of proportional relationships can be considered alongside the practical measures of building, including palms, fingers and cubits. In the author's reading, such relationships give sacred space a cosmological significance. The comparison is interpretive: it does not constitute documentary proof that the builders of the Pantheon followed a specifically Vitruvian cosmic program.[55]

Historical note. The Hadrianic Pantheon belongs to a later architectural context than Vitruvius's treatise. The relation proposed here concerns comparison between proportional schemes, not a demonstrated direct dependence of the building on the text.

In the author's hermeneutic model, a cube of side six and volume 216 becomes a figure for a cosmic order of measurement. Vitruvius's discussion of 216 verses

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54**Marcus Vipsanius Agrippa (c. 63–12 BCE) was a Roman general and statesman. He commissioned the first Pantheon at Rome; the standing building belongs to a later reconstruction. The inscription naming Agrippa must therefore be distinguished from an attribution of the surviving design to him.**

55**Ad Quadratum** is a constructive method that relates geometry to architecture within a system of proportions. In the design of Gothic cathedrals and religious temples, it was used as the foundation and framework of human geometry. It represents a state of consciousness and the achievement of squaring the circle.

provides a point of departure for this reading. It does not itself identify that cube as the fundamental unit of architectural ratiocinatio or formulate a material cosmogony.

In the preface to Book V, paragraphs 3–4, Vitruvius invokes a Pythagorean practice of arranging precepts in cubic units. The relevant wording concerns textual composition and memory:

"Pythagoras and those who followed his school also chose to set down their precepts in books according to cubic principles."

The units discussed here consist of 216 verses. They should not be silently converted into abstract units of a cosmic construction.

Literal translation (*ad verbum*)

"Pythagoras and those who followed his school also chose to write their precepts in books according to cubic principles. They made a cube consist of 216 verses and thought that no more than three such units should be included in a single composition. A cube is a solid bounded by square faces of equal breadth. When thrown, it remains stable on whichever face it comes to rest, so long as it is left untouched."

Notes on Latin technical terms:

1. Cybicis rationibus. Krohn prints this form in V.praef.3. The phrase refers to arranging precepts according to cubic principles; ratio has a range of senses that includes method, reckoning and proportional relation.
2. **"Constituerunt"**: It is the verb *constituo*, which means to establish, to set up, to fix or to determine.
3. The stability of memory. In V.praef.4, the stability of a cube is compared with the retention of verses in memory. Mundi totius constitutionem does not occur in this passage and must not be glossed as if it were part of the quoted Latin.
4. Compilation into one corpus. Vitruvius describes his use of earlier technical writings elsewhere: collecta in unum coegi corpus, "I brought the collected material together into a single body", occurs in VII.praef.14. That statement supports discussion of his compositional method, but it should not be inserted into a quotation from V.praef.3–4.

Translational note. Latin word order is preserved where it conveys particular emphasis, including the delayed position of the verb. English syntax is adjusted

where necessary for intelligibility, without altering the sequence of the argument.

Vitruvius, *De architectura* V, Preface (key passage)

"Pythagoras and those who followed his school also chose to set down their precepts in books according to cubic principles. They established a unit of 216 verses and thought that no more than three such units should be contained in a single composition."

The comparison concerns the arrangement and retention of teaching. A group of 216 verses is treated as a cube, whose stability provides an analogy for memory. The passage does not say that the figure corresponds to the constitution of the universe.

Author's interpretation. The cube and the number 216 may be brought into a wider symbolic reading of order and measure. This comparison is offered as a hermeneutic proposal. It is not a translation of an ancient assertion that the universe is constituted according to this number.

Original text in Latin (critical edition):

Etiamque Pythagorae quique eius haeresim fuerunt secuti, placuit cybicis rationibus praecepta in voluminibus scribere, constitueruntque cybum CCXVI versus eosque non plus tres in una conscriptione oportere esse putaverunt.

"Pythagoras and those who followed his school also chose to set down their precepts in books according to cubic principles. They made a cube consist of 216 verses and thought that no more than three such units should be included in a single composition."

Context and explanation

Vitruvius uses this Pythagorean reference to justify his own method of composition of the treatise:

- The Pythagoreans organized their teachings in mathematically structured **volumes according** to the "**cubic ratio** " (*cubicis rationibus*).
- The number 216 is the cube of six: $6^3 = 216$. Vitruvius's discussion of a mathematically perfect number in III.1 concerns six; it does not establish that 216 is itself a perfect number.

- The limit stated is three cubic units in one composition, each unit consisting of 216 verses. The passage does not prescribe a maximum of three verses for each precept.

Elsewhere, at VII.praef.14, Vitruvius explains that he gathered useful material from earlier technical writings into a single corpus. That statement can be compared with the compositional discussion in Book V, provided that the passages remain distinct.

The analogy is with a cube's stability: whichever face it rests on, it remains in place until disturbed. Vitruvius uses that image to explain how a defined group of verses may remain stable in memory.

This passage links 216-verse units, cubic stability and memory. It provides material for later symbolic interpretations, but those interpretations should remain distinct from what Vitruvius explicitly says. His other references to Pythagoras need not be assumed to prescribe the same compositional rule.

What we do find in the rich Pythagorean tradition:

1. **Vitruvius** is the **main and almost only source** that mentions this practice of organizing texts into blocks of 216 verses (6^3).

2. Other mentions related to the number 216 in ancient or Neopythagorean Pythagoreanism:

- Cycle of transmigration: According to later doxographical accounts (attributed to Aristoxenus and collected by Iamblichus), the Pythagorean tradition associated the number 216 with a period between reincarnations. This information comes from ancient biographical literature about Pythagoras and is cited here for documentary purposes to illustrate the numerological connotations that Antiquity attributed to this number; its value is testimonial, not doctrinal.

- The number 216 was held significant as $6 \times 6 \times 6$, the cube of six; in Pythagorean number theory cubic numbers were taken as figures of stability. This symbolic valuation is recorded here as a feature of that tradition, not as a claim advanced by Vitruvius himself.

3. Rich preserved Pythagorean texts:

- **Golden Verses** → 71 verses (not 216).

- Fragments of **Philolaus**, **Archytas**, **Eurytus** → They do not mention 216 verses.

- **Iamblichus** (*Pythagorean Life*) and **Porphyry → They speak of the** number 216 in contexts of reincarnation and cycles, but not of textual organization.

Academic conclusion:

Vitruvius's reference appears to derive from an **oral or lost tradition** of ancient Pythagoreanism regarding how to structure their writings to facilitate memorization and maintain harmonic order. No other direct Pythagorean text survives that confirms or expands upon this custom of " 216 verses."

It is very likely that Vitruvius is transmitting an anecdote or practice known in Hellenistic scholarly circles, but which has not reached us in independent sources.

Current scientific literature recognizes that the number 216 occupies a relevant place in the Pythagorean arithmetic recorded by Vitruvius; however, the description of a proportional system should not be confused with an ontology of the number. The tendency to overemphasize the symbolic value of 216 usually derives from an exegesis that exceeds the limits of primary evidence, constituting an interpretive construction that, while suggestive, lacks the necessary support in the canon of ancient architecture."

the cube of six" or *" a value of geometric significance in the Pythagorean tradition "*.

The Golden Ratio and Architecture

Editorial note. *— The sections that follow develop an interpretive and hermeneutic reading that belongs to the present editor rather than to Vitruvius or to the established philological record. Vitruvius nowhere names the golden section (sectio aurea), and the symbolic and proportional resonances explored here are offered as the editor's reflective perspective, clearly distinct from the critical text, the apparatus criticus, and the consensus of modern scholarship set out elsewhere in this edition. The reader concerned only with the technical and historical Vitruvius may proceed directly to the ten books.*

When we speak of the "divine proportion," [56]we are referring to a numerical relationship of spaces and a way of articulating geometries. It involves cutting a line into two unequal parts, such that the larger segment is to the whole line as the smaller is to the larger. In this way, a relationship of sizes is established, with the same proportionality between the whole divided into larger and smaller parts.

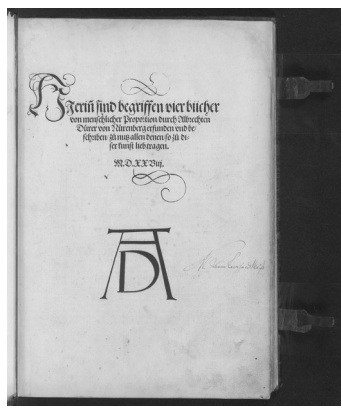


Figure 7. Albrecht Dürer, Hierinn sind begriffen vier Bücher von menschlicher Proportion (Nuremberg, 1528), title page. Library of Congress, Rosenwald Collection, catalog record 49039321. Institutional digitization of the historical printed edition.

56**The golden number** or golden ratio (also called extreme and mean ratio, golden ratio, golden mean, golden proportion and divine proportion), represented by the Greek letter φ (phi) (lowercase) or Φ (Phi) (uppercase), in honor of the Greek sculptor Phidias, is an irrational number.

Cover of Vier *Bücher von menschlicher Proportion* (*Studies on Human Proportion*) with the monogram of Albrecht Dürer's signature. Year 1528

This way of proportionally sectioning a line or a rectangle is called the “Golden Proportion.” The numerical representation of this size relationship is called the golden number.

The parts creates in the whole a correct articulation of different spaces and uses whose proportion is the golden number.[57]

The extent to which the architecture of antiquity was actually composed according to the golden ratio is much debated and far from settled. Vitruvius himself nowhere invokes it: his system of proportion is modular and commensurable (*symmetria*), founded on whole-number ratios derived from a common unit rather than on the irrational ratio Φ.

The golden ratio ($\Phi \approx 1.618$) is a mathematical relationship that expresses the division of a segment into two unequal parts such that the ratio of the whole segment to the larger part is equal to the ratio of the larger part to the smaller. Its geometric expression in logarithmic spirals — known as " golden spirals " — appears in numerous natural forms.

Vitruvius does talk extensively about proportions, symmetry (*symmetria*) and harmony in architecture, especially in Book III (proportions of the temple and the human body), but he uses rational proportions (simple fractions such as 1:2, 1:3, 2:3, 3:5, etc.), not the irrational proportion φ.

What Vitruvius does mention in relation to this:

- Proportions of the human body and their relationship to the circle and the square (famous passage that inspired Leonardo da Vinci).
- The **Ionic volute** of the capital, which has a spiral shape. However, Vitruvius describes how **to** construct it using **geometric methods of compass and straightedge**, not using the golden ratio.

According to the oldest surviving treatise on architecture, " De architectura, " or the 10 books of architecture by Vitruvius, 1st century BC, inspired by

57 The comparison between φ and π in this discussion belongs to the author’s symbolic and geometrical interpretation. Numerically, $\varphi = (1 + \sqrt{5})/2 \approx 1.6180339887$, while $\pi \approx 3.1415926536$; the symbolism does not establish a numerical identity between them.

Hellenistic theorists, architecture rests on three principles: Beauty (*venustas*), Firmness (*firmitas*), and Utility (*utilitas*), or the wise organization of spaces.[58]

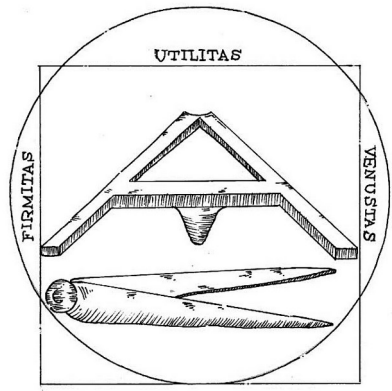


Figure 8. The Vitruvian triad: firmitas, utilitas and venustas. Comparative diagram from the illustrative material supplied for this edition; conceptual reference: Vitruvius 1.3.2. It is an explanatory image, not an illustration preserved from the ancient treatise.

For Vitruvius, architecture may be defined as the equilibrium of three governing demands — durability (*firmitas*), serviceability (*utilitas*), and grace (*venustas*) — no one of which should override the others, each rather sustaining and completing the rest. To weigh any building without holding all three in view at once would be to judge it only in part.

The canon established by Marcus Vitruvius in De architectura constitutes the most influential formulation of this triad in Antiquity. Its principles served as the basis for classical architectural composition, visually and conceptually organizing buildings through modular proportions, symmetry, and eurhythmy. Although Vitruvius does not mention the golden ratio (φ), his system of anthropomorphic proportions exerted a profound subsequent influence on architectural theory.

Geometric and modular model for the division of architectural space based on traditional Roman units such as the cubit (*cubitus*) and the palm (*palmus*). This

58Firmitas, utilitas and venustas are the technical terms of De architectura 1.3.2. Modern reception often renders them 'solidity, utility and beauty', but Vitruvius defines them through foundations and materials, an arrangement suited to use, and the proportional correspondence of a building's members.

system used the human figure as its ideal reference, whose image — later known as *Homo ad circulum* or *Homo ad quadratum* — was inscribed within a circle and a square. This drawing, which is not preserved in the ancient manuscripts of *De architectura*, was reinterpreted and popularized during the Renaissance, reaching its highest expression in Leonardo da Vinci's famous version.

During the Renaissance, the rediscovery and translation of *De architectura* had a decisive impact on architectural theory and practice. Among the most important editions is that of Cesare Cesariano (Como, 1521), the first illustrated translation into Italian, notable for its visual richness. Cesariano reinterpreted the figure of the Vitruvian man in poses *ad quadratum* and *ad circulum*, attempting to graphically solve the classic problem of squaring the circle. These illustrations contributed significantly to the dissemination of Vitruvian principles and the consolidation of the humanist ideal of *Homo Universalis*.[59]
60 61

The meaning of the Vitruvian Man and the squaring of the circle

The **Vitruvian Man** (also known as Homo *ad circulum* and *Homo ad quadratum*) is one of the most emblematic images in the history of architecture and Western thought. Its origin lies in **Book III** of *De architectura* by Marcus Vitruvius Pollio, where the Roman author describes the ideal proportions of the human body and its relationship to perfect geometric forms.

" The center of the body is naturally the navel. If a man lies on his back with his arms and legs outstretched, and a circle is drawn with the navel as its center, it

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59**De architectura remained in circulation throughout the Middle Ages; Renaissance interest should not be described as its recovery from complete oblivion. Harley MS 2767, now in the British Library, is a ninth-century witness and is distinct from Cotton MS Cleopatra D I. Other important witnesses include the Gudianus and Selestadiensis codices. Manuscript dates, provenance and relationships must be established from the relevant catalog and critical edition rather than inferred from Renaissance accounts of rediscovery.**

60**Cesar Cesariano** 's translation is the most valued for its visual richness.

61Since time immemorial, man as a tree and his feet reinterpreting roots, represent the achievement of the Geometer's Apotheosis.

will touch the fingers and toes. Furthermore, if a square is drawn around the same body, it will be found that the width is equal to the height. "

Vitruvius did not include a drawing in his original treatise. The image we know today is a **Renaissance interpretation,** the most famous being the one created **by** Leonardo **da Vinci** around 1490.

Symbolic and philosophical meaning

The figure of the man inscribed simultaneously in a **circle** and a **square** represents several levels of meaning:

1. **Harmony between the Microcosm and the Macrocosm:** Man is seen as a perfect reflection of the universe. The circle symbolizes the divine, the celestial, and the perfect (the cosmos), while the square represents the earthly, the material, and the human.
2. **Squaring the Circle.** The image alludes to the ancient geometric problem of squaring the circle: constructing a square with the same area as a given circle. This problem, considered unsolvable with classical tools, acquired a profound symbolic meaning: the reconciliation between the finite (square) and the infinite (circle), between matter and spirit.
3. **Proportion and Beauty:** It represents the classical ideal that beauty arises from harmonious proportion (*symmetry*). The human body becomes the measure of all things.

Why was the Renaissance so obsessed with this image?

The Renaissance saw in the Vitruvian Man the perfect embodiment of **Homo Universalis** (Universal Man), a central ideal of Renaissance humanism. The main reasons were:

- **Anthropocentrism**: Man was no longer just a creature of God, but the measure of all things (as Protagoras stated). Leonardo and his contemporaries saw in this figure the dignity and unlimited potential of humankind.
- **Reconciliation between Science and Art**: The image united geometry, anatomy, architecture and philosophy, fields that the Renaissance sought to integrate.
- **Revival of Classicism**: It represented the recovery of ancient wisdom (Vitruvius) adapted to the new humanist spirit.

- **Spiritual symbolism**: Man's ability to be inscribed both in the circle (divine perfection) and in the square (material reality) symbolized the human being's aspiration to unite the earthly and the celestial.

Cesare Cesariano's illustrated edition of Vitruvius (1521) presents a Renaissance interpretation of the body in relation to circle and square. It postdates Leonardo's drawing of c. 1490 and therefore cannot be cited as a direct influence on that drawing.

Definition of Homo Universalis

The expression **Homo Universalis** (Universal Man) refers to the Renaissance ideal of an individual who develops all their faculties to the fullest: intellectual, artistic, scientific, and physical. Leonardo da Vinci is the paradigmatic example: painter, anatomist, engineer, architect, inventor, and theorist.

Thus the Vitruvian Man became the **visual symbol of** Homo Universalis: a harmonious, proportional being capable of encompassing both the material and spiritual worlds.[62]

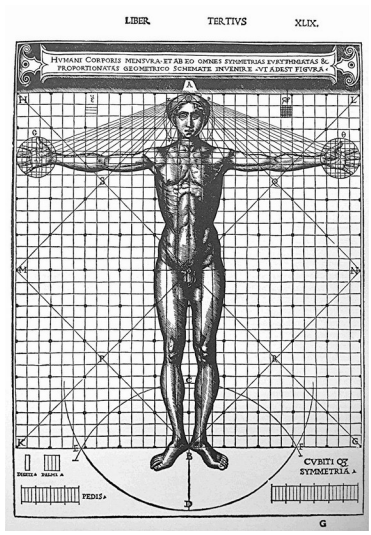


Figure 9. Cesare Cesariano, human proportion, in Di Lucio Vitruvio Pollione de architectura libri dece (Como, 1521), Book III, fol. XLIXr. Reproduction of the Renaissance woodcut interpreting Vitruvius 3.1; not a surviving Vitruvian diagram.

62 The man with his arms open to the cosmos, inscribed within a star as shown in the treatise of Cornelius Agrippa, symbol of man open to the cosmos.

Homo ad circulum Vitruvian Illustration of the edition of the Commentary on Vitruvius by Cesare Cesariano (1521).

This concept reached its full maturity during the Italian Renaissance, finding one of its most prominent theorists in Leon Battista Alberti (1404–1472). Alberti, an **architect**, humanist, and writer, argued that the artist should not be limited to the traditional role of craftsman, but rather should be a well-rounded intellectual, versed in all disciplines of knowledge. In his treatise *De re aedificatoria* (1452), Alberti asserted that the architect should possess a comprehensive education encompassing the arts, sciences, and humanities, far surpassing mere technical skill.

This vision encapsulates one of the essential principles of Renaissance Humanism: the dignification of humankind as beings capable of harmoniously cultivating all their faculties. For Alberti and his contemporaries, architecture was not only a practical art, but the supreme discipline where scientific knowledge, artistic creativity, and humanistic wisdom converged.

In this light, it can be said that **the Renaissance was, to a large extent, a product of architectural thought. Architecture** became the quintessential all-encompassing art, in which the ideal of *Homo Universalis was materialized: the* harmonious man, capable of measuring, understanding, and beautifying the world.

" The Renaissance was defined by a renewed anthropological conception that placed humankind at the center of the cosmos, endowing it with an unlimited capacity for understanding and transforming reality. This humanist imprint urged the individual to cultivate encyclopedic knowledge, promoting the flourishing of the arts and sciences as a manifestation of human potential."

Within this framework, the interest in "squaring the circle" transcended mere mathematical curiosity to become a symbol of intellectual apotheosis: the attempt to reconcile earthly finitude (the square) with divine infinity (the circle). In this quest, the figure of the Vitruvian Man, embedded in the *ad quadratum paradigm*, was consolidated as the archetype of the *Uomo Universale*, becoming the ethical and aesthetic guiding principle of the era.

The reevaluation of Vitruvian thought was fundamental in this process, materializing in critical translations and commentaries on *De architectura* that allowed the integration of ancient theory into modern practice. Particularly

noteworthy are the editions of Cesare Cesariano (1521) and Daniele Barbaro (1556), whose contributions were essential in articulating the Vitruvian triad (*firmitas, utilitas, venustas*) under a new harmonic logic. Under this paradigm, the canon of human proportions did not operate merely as a rule of measurement, but as the key to architectural composition; a sacred geometry where the human body, as a microcosm, was established as the guiding axis that dictated the order and proportion of universal architecture.[63] [64]

Classical architecture was conceived as an expressive synthesis of the intelligible universe, in which **idea**, **form,** and **number converge**. In this worldview, humankind occupied a central and guiding place, acting as the measure and axis of architectural composition.

The great works of the past have endured precisely because they were created according to the principles of nature: with logic, economy, and efficiency. Through a minimum of intelligently organized matter, a maximum of effect and stability was achieved. In this context, the **golden ratio** was understood as a universal principle of balance between the part and the whole, present both in the structure of the cosmos and in human creation.

Buildings of the magnitude of the Pantheon in Rome or the great Roman villas were conceived according to Vitruvian principles of proportion; beyond their utilitarian function they came to be regarded as architectural archetypes, embodying enduring models for human experience.

Proportion was thus understood, in the classical conception, as a principle of harmony in which the parts are resolved into a coherent whole. The association of this harmony with the golden ratio, however, belongs to later interpreters — from the Renaissance onward — and is not warranted by Vitruvius's own modular system.

"It is plausible to conjecture that the cosmos is not a static entity, but the phenomenological materialization of an original geometric *idea-form*, fertilized

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63 **Ad Quadratum** is a constructive method that relates geometry to architecture in a system of proportions, and a numerical form of light, as well as the representation of a state of consciousness.

64 The **universal man** is the absolutely polished man, as a symbol of the center of the universe.

by the power of the Word. Under this premise, reality becomes a 'ship under eternal construction,' a dynamic system organized through incessant mutation."

This vision finds a fundamental echo in the thought of Johannes Kepler, who in his work *Mysterium Cosmographicum* postulates the ontological primacy of geometry in the creative act:

"Geometry provided God with the model for creation; geometry precedes the existence of divinity or, better yet, is the very essence of God." This perspective transforms the architectural practice: if geometry constitutes the grammar of the divine logos, the architect, in designing their work, is merely participating in the process of "precipitation" of the intelligible into the sensible. Architecture is revealed, then, as an act of cosmic emulation, where measure and form act as the necessary bridge between the immutability of the idea and the fluidity of the material world.[65]

The best way to find definitions of Vitruvian Man or Geometric Man is through Pico della Mirandola's discourse on the dignity of man.[66]

"I have not given you, Adam, a fixed place, nor a proper form, nor a particular gift," God says to man, "so that you may possess the place, the form, and the gifts you desire, according to your will and your own decision. To the other creatures I have prescribed a defined nature under established laws; you, however, not limited by restrictions, will determine your own nature by the whim of your free will. I have placed you at the center of the world so that from there you may observe all that the universe contains. I have made you neither celestial nor terrestrial, neither mortal nor immortal, so that, as the sculptor of yourself, you may mold yourself into the form you prefer. You may degenerate into the lower forms, which are bestial, or regenerate yourself, according to your decision, into the higher forms, which are divine."

65**Johannes Kepler** (Weil der Stadt, Germany, December 27, 1571 – Regensburg, Germany, November 15, 1630), a key figure in the Scientific Revolution, was a German astronomer and mathematician. He is primarily known for his laws of planetary motion around the Sun. He was a collaborator of Tycho Brahe, whom he succeeded as Imperial Mathematician to Rudolf II.

66**Giovanni Pico della Mirandola (1463–1494) was an Italian humanist and philosopher. His Oration on the Dignity of Man is a prominent work in the history of Renaissance humanism.**

Note: Pico della Mirandola, G., Oratio de hominis dignitate (1486). Critical edition consulted: [Name of the edition you prefer].

"Who would n't admire this chameleon of ours? " Pico added. "For, as the mysteries so aptly suggested, man is symbolized by the figure of Proteus because of his mutability and capacity for transformation. Let us understand, then, that we were born with the power to be whatever we choose; let a noble ambition invade our spirit so that, despising mediocrity, we may attain the excellence of higher things. "

"Geometry has two great treasures: one is the Pythagorean theorem, the other, the ratio of a line segment to its extreme and its proportional. The first can be compared to a measure of gold; the second should be called a precious jewel."[67]

Johannes Kepler

Reception and exegesis of the Vitruvian canon: From *Homo bene figuratus* to sacred geometry

The "Vitruvian Man" constitutes a paradigmatic synthesis of human proportions, originally articulated under an architectural and geometric logic in the treatises of the Roman theorist Vitruvius. While contemporary iconography has been dominated by Leonardo da Vinci's celebrated illustration (c. 1490), it is imperative to recognize that this figure represents only one of the many interpretations that emerged during the Renaissance. Among these, Cesare Cesariano's version (1521) stands out, whose technical precision and compositional rigor position it as one of the most comprehensive treatises on the representation of the human canon.

The nature of Da Vinci's sketch — originating from his personal notes — transcends mere anatomical observation by superimposing two geometric configurations: quadrature (*homo ad quadratum*) and circularity (*homo ad circulum*). This duality underlies the Vitruvian principle of *homo bene figuratus*, which postulates a harmonious correlation between anatomy and the laws of cosmic order. As Vitruvius explains in *De architectura* (Book III, 1, 3):

67Kepler 's Platonic model of the solar system has aroused the highest interest throughout the ages.

“Likewise, the central point of the human body is naturally the navel. For if a man be laid upon his back, with his hands and feet outstretched, and a compass is placed on his navel, when a circle is drawn, the fingers and toes will touch the circumference. Similarly, when the shape of the square is applied to the body, it is observed that the height from the soles of the feet to the crown of the head is equal to the wingspan of the outstretched arms. ”

Historically, the absence of illustrations in Vitruvius's original manuscripts acted as a creative catalyst, encouraging scholars and artists, such as Albrecht Dürer and Villard de Honnecourt, to develop systems of visual representation. In architecture, the construction method known as ad quadratum *transcended* the artistic realm to become the governing system of spatial composition. This paradigm, based on Euclidean geometry, was decisive in the construction of Roman temples and Gothic cathedrals, where the square functioned as the generating module for the arrangement of columns, the span of arches, and the height of vaults.

The persistence of this model in the history of art and architecture underscores the convergence between mathematical metrics and humanist aesthetics. Da Vinci's representation, beyond being an anatomical study or a possible self-portrait, embodies the Renaissance aspiration to grasp the order of the universe through bodily measurement. Thus, what began as a note in a technical treatise has transformed into a universal canon of Western culture, symbolizing the moment when geometry ceased to be an abstraction and became the foundation of human existence.

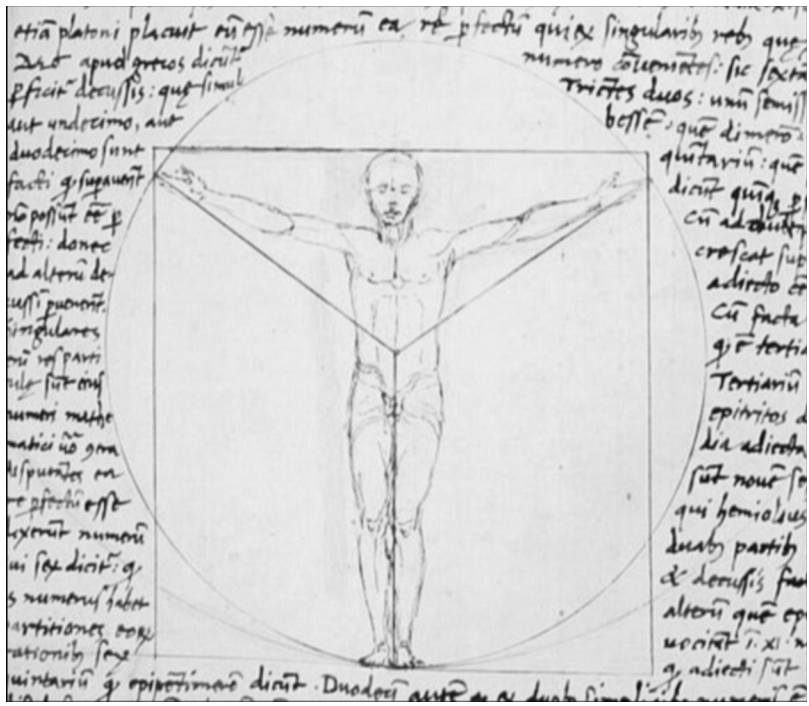


Figure 10. Modern digital reconstruction after the drawing attributed to Giacomo Andrea da Ferrara, c. 1490. Historical exemplar: Biblioteca Comunale Ariostea, Ferrara, MS Classe II, no. 176, fol. 78v. Supplied for this edition; the reconstructed lettering is not used as manuscript evidence.

Giacomo Andrea da Ferrara: The forgotten precursor

Giacomo Andrea da Ferrara was a contemporary architect and close friend of Leonardo da Vinci. His version of the *Vitruvian Man*, dated around 1490 and preserved in the Ariostea Library in Ferrara (Manuscript *Classe II N 176, fol. 78v*), is of paramount importance for understanding the intellectual context of the Renaissance.

1. **Architectural rigor:** While Leonardo's version stands out for its artistic and anatomical virtuosity, Giacomo Andrea's emphasizes **geometric functionality**. His drawing is deeply intertwined with **the** technical reading of *De architectura*.

2. **Context of the discovery:** The discovery of this drawing in the Ariostea Library was a relevant historiographical milestone, as it demonstrated

that the study of the "Vitruvian proportion " was an active field of debate among architects of the late 15th century and not a solitary work of Da Vinci.

The drawing attributed to Giacomo Andrea da Ferrara, preserved in the Biblioteca Ariostea, Ferrara (Classe II, no. 176, fol. 78v), places Leonardo's study within a wider Renaissance engagement with Vitruvian proportion. Its relation to Leonardo remains a question for the history of drawing and textual interpretation. Both works permit comparison between bodily measure and architectural geometry. The further association with a cubic ratio is the author's hypothesis; the drawing alone does not prove that such a doctrine governed Renaissance design.

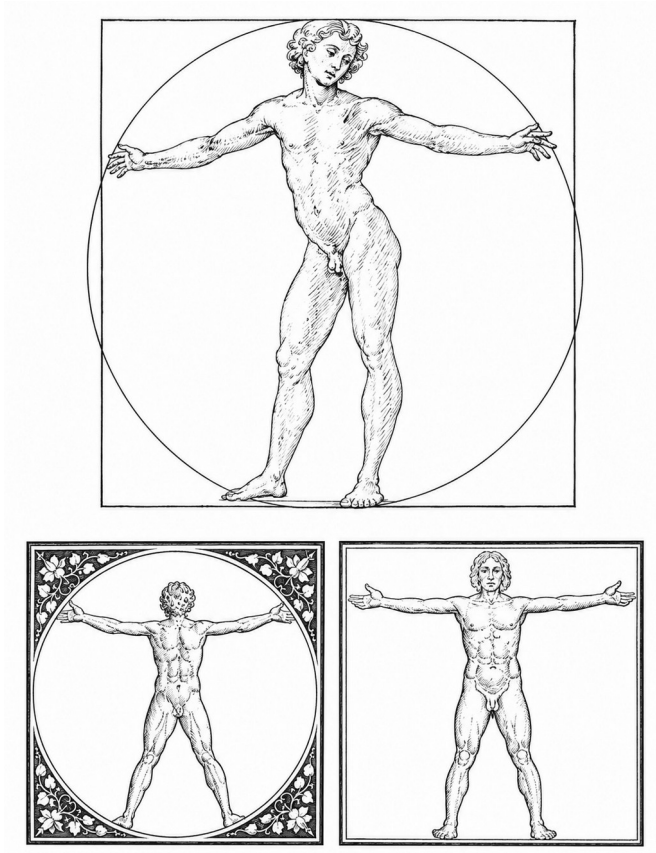


Figure 11. Modern composite recreation of three proportional studies associated with Francesco di Giorgio Martini, supplied for this edition (2026). The composite brings together separate proportional constructions; it is not a facsimile of a single manuscript leaf.

Francesco di Giorgio Martini (1439–1502) is a pivotal figure in the transition of architectural thought during the *Quattrocento*, acting as the necessary bridge between humanist theory and the practice of military engineering. His work is remarkable not only for its technical skill but also for its profound attempt to systematize architecture based on anthropomorphic analogy.

Francesco di Giorgio's Treatise: Architecture as Body

To systematize Vitruvian theory through an **original visual exegesis.** In his *Trattato di architettura civile e militare*, he not only interprets Vitruvius's canon but actively develops it.

His famous drawing of the **"Church-Man"** is an illustration of the hypothesis about the cubus rationalis:

- **The anthropomorphic analogy: Francesco** di Giorgio argues that the plan of a temple should be directly based on the proportions of a recumbent human body. The altar, for example, should correspond to the position of the head or the heart**.**
- **Structure as an organism:** Unlike other theorists, his approach was less speculative and more "constructive." For him, the building possessed *nervi* (nerves), *ossa* (bones), and *articuli* (joints), legitimizing the idea that architecture is a living organism governed by strict geometric laws.

"*Architecture is a science that, through proportion and measure, imitates divine creation; therefore, the architect must be, above all, a geometer who translates the order of the universe into stone.*" > — *(Conceptual attribution based on the principles of Francesco di Giorgio).*

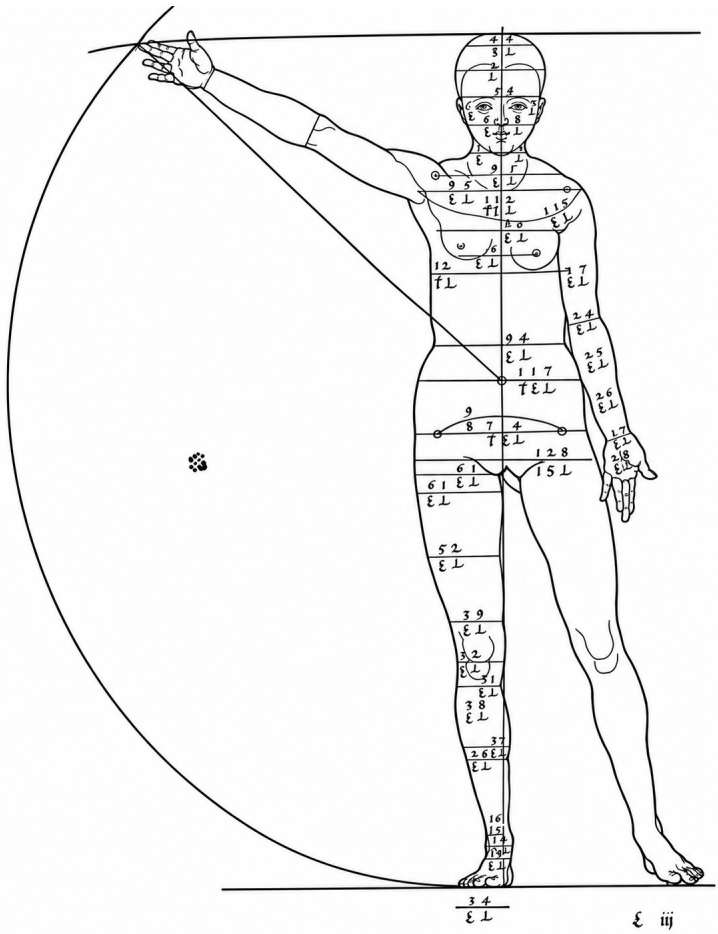


Figure 12. Modern line reconstruction of a female proportional study, supplied for this edition. Comparative context: the Renaissance study of bodily measure discussed in Albrecht Dürer's Vier Bücher von menschlicher Proportion (1528). It is not presented as a facsimile of an identified leaf of that edition.

Albrecht Dürer occupies a privileged place in the historiography of art and the theory of Renaissance architecture, not only as an artist, but also as the principal architect of the theoretical systematization of human proportions in the Germanic world. His work is the meeting point where the geometric rigor of the Italian *Quattrocento* merges with the analytical precision of Nordic humanism.

Dürer: The geometric synthesis of the canon

To understand the figure of women in Dürer's studies, it is necessary to situate it as the result of a convergence of intellectual sources:

1. **The Vitruvian and Euclidean influence:** Dürer assimilated Vitruvius's concept of *homo bene figuratus*, but elevated it to a higher mathematical dimension by applying the logic of Euclid's *Elements*. For Dürer, beauty was not merely a matter of visual harmony, but a demonstrable geometric construction.

2. **The mathematical legacy (Alberti and Pacioli):** Dürer not only drew upon Alberti's theory of *perspective*, but also incorporated Luca Pacioli's research on the *Divine Proportion*. The application of the golden section and regular polygons in the representation of female anatomy allowed Dürer to "rationalize" the body, moving it away from a casual, organic representation and placing it within a system of precise measurements.

The *Female Figure* as a metric canon

In his treatise *The Four Books on Human Proportion* (*Vier Bücher von menschlicher Proportion*, 1528), Dürer establishes a system where the female figure is articulated through a complex network of geometric proportions. This study stands out for two fundamental contributions:

- **Variability of the canon:** Unlike Vitruvius's static and universal canon, Dürer proposes a "variability of proportions." He classifies different types of bodies according to their constitution, anticipating a more scientific and empirical view of the subject.

• **The geometry of the female body:** For Dürer, the female figure corresponds to a geometry of curves that, nevertheless, are derived from perfect rectangles and circles. The integration of these forms reflects his interest in the *quadratum* and the *circulum*, where the female body becomes the "container" of these mathematical laws.

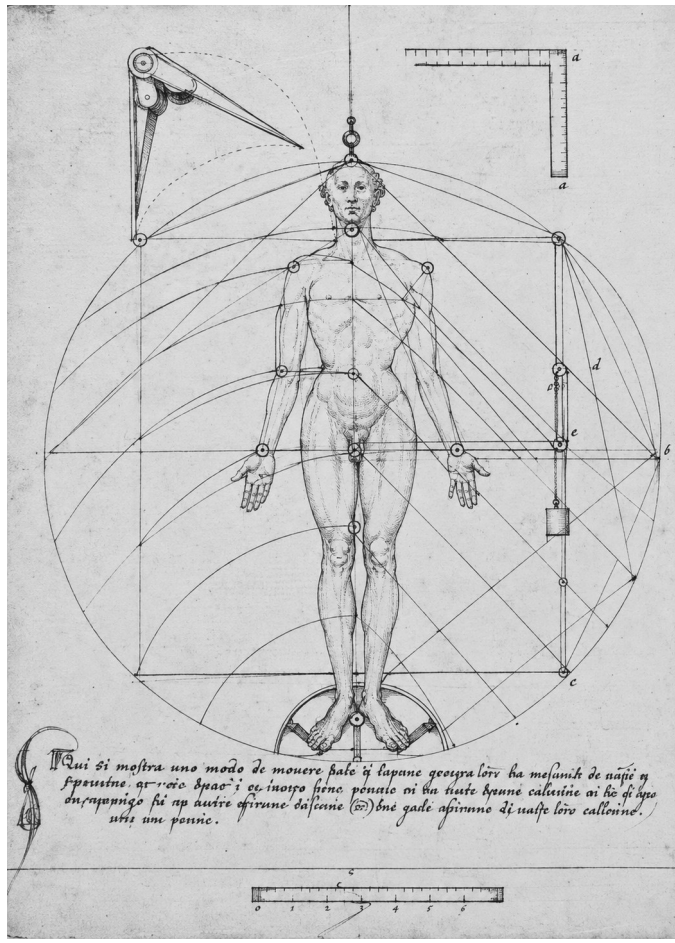


Figure 13. Modern reconstruction after a proportional study associated with Mariano di Jacopo, called Taccola, and his De machinis. Supplied for this edition; the reconstructed image is not a documentary facsimile of a manuscript leaf.

Mariano di Jacopo, known as **il Taccola** (1382–1453), is an essential figure for understanding the transition between medieval technical tradition and *Renaissance* engineering. While his name has often been overshadowed by

figures such as Leonardo da Vinci or Francesco di Giorgio, his work is the true foundation of Quattrocento engineering.

Taccola: The « Archimedes of Siena » and technique as *Logos*

Taccola was not just a compiler of machines; he was one of the first to conceptualize **technology as a graphic language.** His treatises, *De ingeneis* and *De machinis*, represent a qualitative leap in the history of architecture and engineering.

1. **Illustration as a means of transmitting knowledge:** Unlike the manuals of his time, Taccola used drawing not as decorative illustration, but as a tool for technical communication. His diagrams of pulleys, lifting mechanisms, and hydraulic systems allowed engineering knowledge to be standardized.
2. **Engineering as the basis of architecture:** For Taccola, there was no rigid distinction between architecture and mechanics. The construction of a building required a deep understanding of forces, which directly links him to Vitruvian *firmitas. His studies on motion (gears and transmissions) are***, in essence, a practical** application of **geometric reason** to the material world.
3. **The background of Francesco di Giorgio:** It is essential to note that Francesco di Giorgio Martini was an indirect disciple and heir to Taccola's legacy. Many of the technological principles that Francesco integrated into his fortification projects were taken directly from Taccola's notebooks.

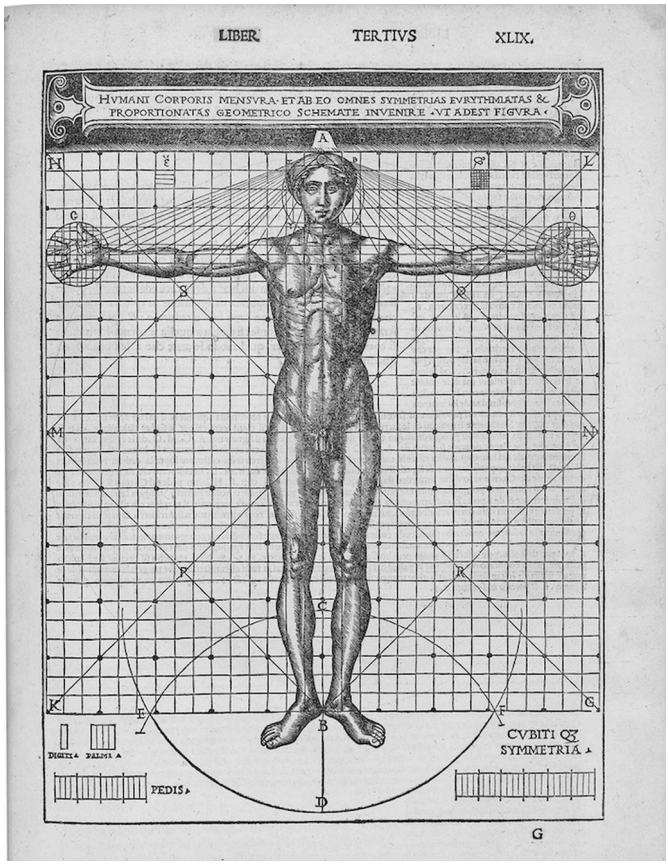


Figure 14. Modern digital reconstruction after Cesare Cesariano's proportional woodcut in Di Lucio Vitruvio Pollione de architectura libri dece (Como, 1521), fol. XLIXr. Supplied for this edition; compare the historical reproduction in Figure 9.

Cesare Cesariano (1483–1543) represents an unavoidable milestone in architectural historiography: his translation and commentary on Vitruvius's *De architectura, published in Como in 1521, is the first* edition **of** the treatise in a vernacular language (Italian). This work is not a simple translation; it is a **technical and visual exegesis that consolidated the** Vitruvian canon in the Renaissance imagination.

Cesariano and the materialization of the canon

the study of the cubic ratio (216) and the tradition of geometric proportion in architecture, Cesariano's contribution is doubly relevant:

1. **Illustration as a theoretical tool:** In the absence of Vitruvius' original plans, Cesariano — drawing on his experience as an active architect on the Milan Cathedral — reconstructed the Roman treatise writer's principles through detailed illustrations. His edition **is** one of the first to offer a visual interpretation of architecture **as a metric system**.

2. **The precision of Homo *ad quadratum*:** On folio **CXLIX r**, Cesariano presents one of the most rigorous interpretations of the squaring of the **circle**. His approach is fundamentally pragmatic: man is not only an aesthetic figure, but a **geometric module whose** proportions dictate the **commensuratio** *(*the necessary symmetry between the parts and the whole) of any building.

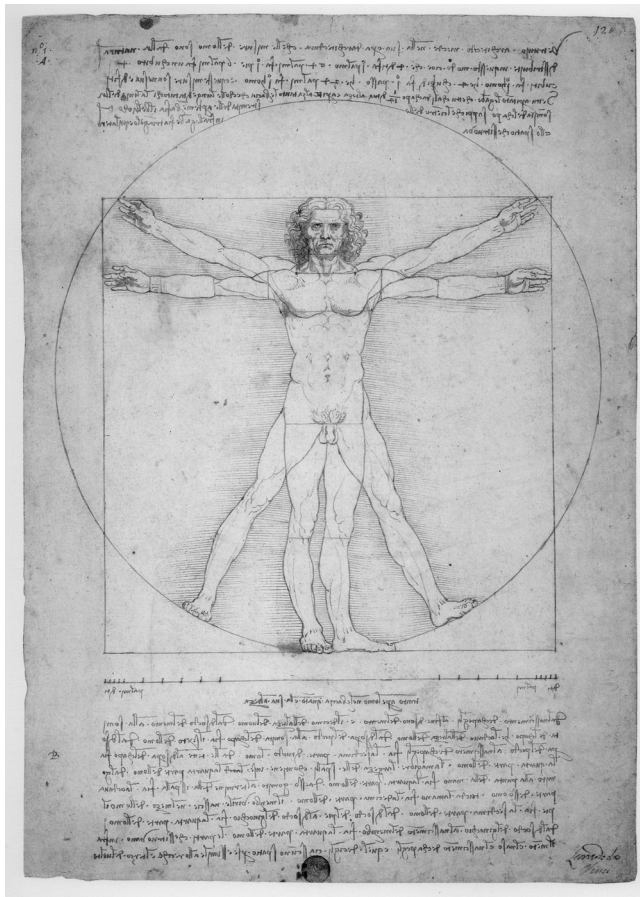


Figure 15. Leonardo da Vinci, Vitruvian Man, c. 1490. Gallerie dell'Accademia, Venice, Gabinetto dei Disegni e delle Stampe, inv. 228r. Reproduction sourced from the Museo Galileo image through Wikimedia Commons. The original is a drawing on paper; the symbolic interpretation developed here is the author's proposal.

Leonardo da Vinci's *Vitruvian Man* (c. 1490) is not just a work of art; it is the most significant graphic document of Renaissance humanism and the epitome of sacred **geometry.** This drawing, a synthesis of pen, ink, and wash on paper, transcends mere anatomical representation to become a visual **treatise on applied cosmology**.

The geometric synthesis: Homo ad *quadratum* and *Homo ad circulum*

The intellectual value of this piece lies in the superposition of two geometric systems that, for the 15th-century mindset, represented the relationship between the finite and the infinite:

1. Homo ad quadratum. In Leonardo's drawing, the square has its center near the groin; the navel is the center of the circle. The association of the square with terrestrial stability and firmitas is the author's symbolic interpretation. Within the proposed reading of the cubic ratio and 216, it may be understood as a planar base for a volume; that association is not an explicit doctrine of Vitruvius.

2. Homo ad circulum. Leonardo places the center of the circle at the navel. The association of the circle with the celestial realm, divinity and perfection belongs to the symbolic reading proposed here. It should be distinguished from the anatomical and geometric instructions of De architectura 3.1.3.

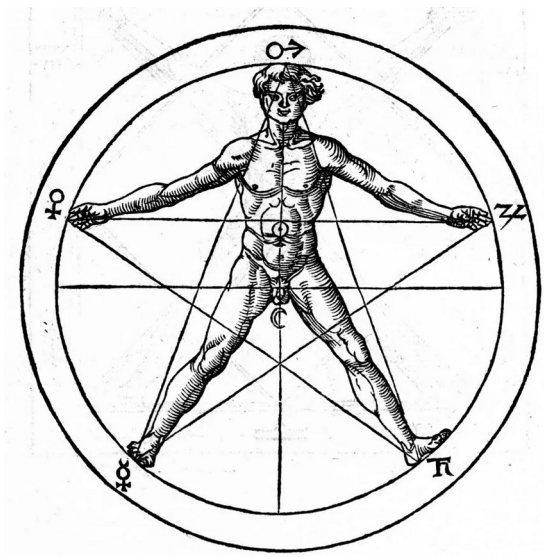


Figure 16. Heinrich Cornelius Agrippa, human body and pentagram, De occulta philosophia libri tres (Cologne, 1533), 2.27. Reproduction supplied for this edition. The woodcut belongs to Renaissance occult philosophy, not to the transmitted illustrations of Vitruvius.

Agrippa: Geometry as Operative Magic

His *De occulta philosophia* (1533) is the compendium where geometry ceases to be a drawing tool and becomes a **language of invocation.** For the study of the cubic ratio (216), Agrippa provides a fundamental perspective:

1. **The harmony of the microcosm and macrocosm:** Agrippa maintains that the human body is a mirror of celestial proportions. His famous representation of man on the pentagram is the mystical extension of Vitruvius 's *Homo ad quadratum*. Where Da Vinci sees mathematics, Agrippa sees spiritual **correspondences**.

Claude Perrault represents the turning point where Renaissance thought is subjected to the **rationalist and critical examination of** the early Enlightenment. His work as translator and commentator of *De architectura* (1673) not only marks a key date in the history of architecture, but also introduces a paradigm shift: architecture is no longer governed solely by Pythagorean dogmas, but by **scientific reason**.

Perrault: Rationalism versus the dogma of the canon

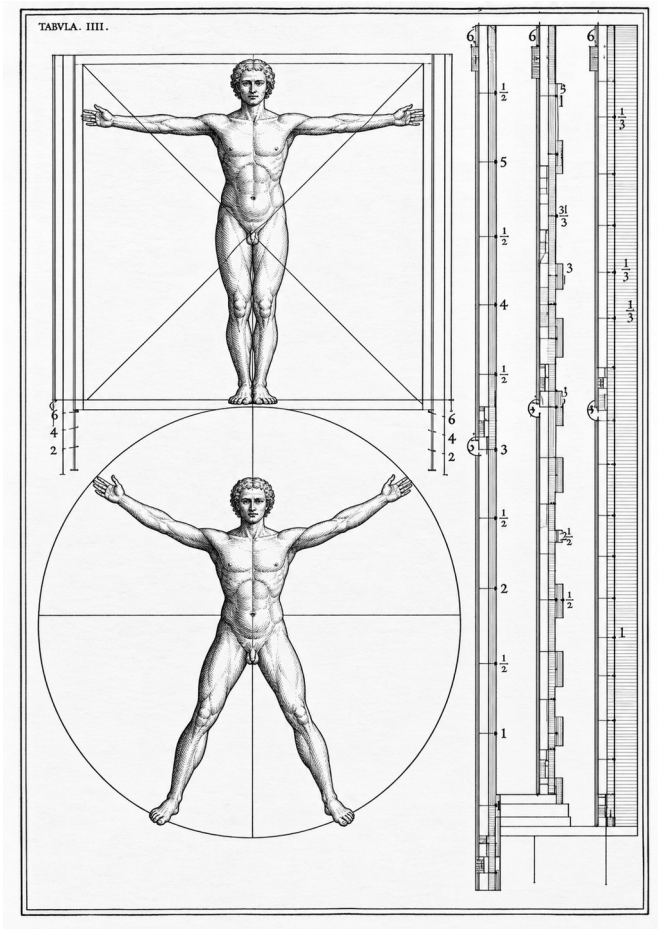


Figure 17. Modern reconstruction after the human-proportion plate in Claude Perrault's French translation, Les dix livres d'architecture de Vitruve (Paris, 1673; revised 1684), as identified by the author. Supplied for this edition; it is not an original print or a documentary facsimile.

Perrault's figure is fundamental to understanding the **decline (or transformation)** of the concept of the *cubus rationalis* (216) and the canon of proportions:

1. **The critique of "positive" vs. "arbitrary" beauty:** Perrault introduced a revolutionary distinction in his treatise. He argued that there are two types of beauty:

- **Positive beauty:** That which depends on the quality of the materials and the technical execution.
- **Arbitrary beauty:** That which depends on taste and conventions (this is where he classifies Vitruvian proportions). For Perrault, the canon of "perfect proportions" (based on numbers like 216 or the golden section) was a **cultural convention** and not an absolute truth inscribed in nature.

2. **Geometric symbolism: While Renaissance theorists (such as Agrippa, Cesariano, and Dürer) sought a divine or alchemical message in geometry, Perrault demystified these systems. For him, Vitruvius's De architectura was a text that needed to be corrected and adapted through the use of logic and physics, moving away from esoteric interpretations.**

3. **Translation as a tool for modernization: His** French translation, profusely illustrated and commented upon, was the one that finally "cleaned" Vitruvius's text of the Neoplatonic interpretations of previous centuries, preparing the ground for French academicism.

The classical orders of architecture

The classical orders of architecture are distinguished by their ornamental characteristics, their treatment of the module, and the organic nature of their composition**.** Classical antiquity bequeathed three main orders: the **Doric**, the **Ionic**, and the **Corinthian**. Later, the Romans incorporated two additional orders: the **Tuscan** and the **Composite**.

The Tuscan order, more austere and simple than the Doric, represents a Roman reinterpretation of the Etruscan column. Each order is defined by its own system of proportions, characteristic capitals, and entablatures. The column shafts often featured vertical flutes along their surface. In the case of the Doric order, the number of flutes was usually **20**, a figure with clear symbolic significance within the Pythagorean and Vitruvian traditions.

One of the characteristics common to the three Greek orders is **entasis**: the columns are slightly wider at the base and gradually narrow imperceptibly

towards the capital, giving the column an organic elegance and vitality**,** avoiding the visual rigidity of a perfect cylindrical shape.[68]

The gradual narrowing of the column shaft as it rises is called *entasis*. This technical and aesthetic feature has the main purpose of correcting *an* optical illusion: without this correction, the straight column would appear slightly concave to the observer.

According to Heron of Alexandria, entasis precisely compensates for this visual distortion, making the column appear perfectly straight and structurally sound. For his part, historian Vincent Scully has emphasized that this subtle bulging of the shaft produces the visual effect that the column, aware of the weight it bears, seems to yield slightly under its own load, generating an impression of organic tension and vitality.[69]

This interpretation coincides with the etymology of the term: the Greek word ἔντασις (*éntasis*) derives from the verb ἐντείνω (*enteínō*), which means " to stretch firmly ", " to tighten" or ″to put under tension ".

The height of columns in the classical orders was determined and visually organized in relation to their lower diameter, used as the basic module of proportion.

Doric column has a height-to-diameter ratio of between 6 and 7 meters, giving it a robust and compact character. The Ionic column reaches a ratio of 8 meters, while the Corinthian, the most slender of all, rises to 10 meters. In this last case, the diameter of the base is repeated ten times in the total height of the column.

These modular relationships were not mere technical conventions, but possessed a profound symbolic meaning, closely linked to the character and aesthetic expression of each order.

68Doric, Ionic and Corinthian forms belong to the Greek architectural tradition discussed by Vitruvius. His Tuscan arrangements are treated at 4.7. The later five-order scheme, including the Composite as a separate order, belongs to the history of classical architectural theory and must not be attributed as such to Vitruvius's own classification.

69**Hero of Alexandria (Ἥρων ὁ Ἀλεξανδρεύς), probably active in the first century CE, was a mathematician and engineer. His treatises on pneumatics, mechanics and automatic devices are fundamental sources for the history of ancient technology.**

De architectura, Vitruvius explicitly associates the architectural orders with divine attributes and cosmic principles. According to the Roman author, the **Doric order**, due to its shorter height and its appearance of robustness and solidity, was the most suitable for male deities. In contrast, the Ionic order**,** more slender and elegant, was primarily reserved for goddesses.

The number 6**,** characteristic of the Doric column, occupied a prominent place in Pythagorean symbolism, associated with cosmic fire and deities such as Poseidon (Neptune), to whose temples this order was usually dedicated.

The number 8**,** characteristic of the Ionic column, was linked in Indo-European antiquity to the movement of the planet Venus. This order was frequently used in temples dedicated to maternal goddesses, such as Hera or Athena Nike (Ἀθηνᾶ Νίκη), the Victorious Athena.[70]

Ionic order

The Ionic order emerged in the 6th century BC in the region of Ionia, located on the coastal and island strip of Southeast Asia Minor. It achieved great popularity during the Archaic period (c. 750–480 BCE).

Vitruvius, in his treatise *De architectura*, establishes a symbolic distinction between the orders, stating that the Doric is inspired by the robust proportions of the male body, while the Ionic is based on the more elegant and slender forms of the female body (*De arch.* IV, 1, 6-7). Although the Roman author does not cite his direct sources, this interpretation is probably rooted in the Hellenistic theoretical tradition, particularly in the ideas of architects such as **Hermogenes of Priene**, author of the famous Temple of Artemis at Magnesia on the Meander (present-day Turkey).

The Ionic order spread from the east to the Greek mainland. It is closely related to the Aeolic order, which fell out of use at the end of the Archaic period. Its most distinctive features are the slender shaft with finer and more numerous flutes, a wider and more elaborate base, and above all, the capital with two

70**Hera** (in ancient Greek Ἥρα H ē ra, or equivalently: Ἥρη Hera (Hērē in Ionic and Homeric Greek), the legitimate wife of Zeus and one of his three sisters in the Olympian pantheon of classical Greek mythology. She also held the title of Queen of the Gods. Her Roman equivalent was Juno. The cow, and later the peacock, were sacrificed to her. Her mother was Rhea and her father Cronus.

opposing volutes (called *helices*). Between these volutes, a closed palm leaf was often carved, an element that evokes ancient symbolic poles of Eastern origin, related to the idea of the axis of the world.

Vitruvius explains in Book IV that three basic tools are sufficient for drawing and subsequently carving the volutes: a ruler, a set square (to establish the midpoint), and a compass (*De arch.* IV, 1, 7). Below the volutes, the capital frequently features a collar or astragal that separates the echinus from the fluted shaft. The upper abacus is often decorated with oval and dart motifs. [71] Between the volutes and the abacus of the Ionic capital are ornamental elements that enrich the transition, while the Ionic abacus adopts a rectangular shape, unlike the Doric, whose abacus is a perfect square.

This formal difference invites interesting reflections of a geometric nature. If we observe the column from its base, looking through its vertical axis, the Doric column visually suggests the ancient problem of squaring the circle: a square that circumscribes a series of concentric circles.

Vitruvius explains the origin and character of the Doric order in the following terms:

"(Ion) conquered the territory of Caria and founded magnificent cities there... These cities, after having expelled the Carians and the Leleges, called this part of the land Ionia after their leader Ion, and, having designated precincts consecrated to the immortal gods, they began to build temples. The first temple they saw built in this way was in a Dorian city. Since they wanted to place columns in this temple and did not know the proper proportions, they investigated how to make them so that they would not only be suitable for bearing the load, but also pleasing in appearance due to their proportions. They measured the footprint of a human foot and related it to the height of the man. When they learned that the foot was one-sixth of a man's height, they transferred this ratio to the column. They made the height of the shaft, including the capital, six times greater than the width of its base." This is how the Doric column brought to buildings the proportions of a male body and its solidity and beauty. "

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71 **The molding** of the cornice of an entablature, located just below the crown and immediately above the frieze. Also called a bed molding.

(De architectura, 4.1.4-6)

Ionic order embodies the symbolism of the spiral and the numbers 8 and 5, closely associated with the movement of the planet Venus in antiquity. The Corinthian order, for its part, represents a more elaborate and ornate synthesis of the two previous orders, constituting a formal culmination linked to the idea of light and spiritual elevation, frequently interpreted as a symbol of immortality.

The Corinthian order is the last of the three classical Greek orders and developed during the 4th century BC. It takes its name from the city of Corinth. The oldest known example is found in the Temple of Apollo Epicurius at Bassae (Arcadia), dating from between 450 and 420 BCE. It is not the main order of the temple — which features an exterior Doric colonnade and an interior Ionic one — but appears exceptionally within the cella.[72]

On the Corinthian order

Vitruvius describes the Corinthian order as one that imitates the slenderness of a maiden, for its form evokes the most delicate and graceful adornments of a young woman in the bloom of her youth:

"The third style, called Corinthian, imitates virginal slenderness, because its form recalls the most beautiful adornments of a maiden, depicted with the most slender limbs due to her tender age. It is said that the discovery of this capital occurred thus: a maiden of Corinth, already of marriageable age, fell ill and died. Her nurse gathered the toys with which the girl used to play in life, placed them in a small basket, and, taking it to her tomb, placed it upon her. To protect these objects from the open air, she covered the basket with a tile. By chance, this basket fell upon an acanthus root. When spring arrived, the acanthus root, pressed by the weight, sprouted leaves and stems which, as they grew along the sides of the basket and met the edges of the tile, bent outwards, forming volutes. "

Explanatory note — Bk. 4.1 (origin of the Corinthian capital). Vitruvius credits the invention of the Corinthian capital to the sculptor Callimachus, active in Athens and Corinth in the later fifth century BC. The Athenians

72It was created as a representation of the cult of Apollo-Asclepius. It can be interpreted as the Greek version of the fundamental pillar, also a philosopher 's sun.

nicknamed him κατατηξίτεχνος (catatexitechnos), 'one who refines his art to the point of wearing it away,' for the extreme delicacy of his marble carving; some editions abbreviate the word to catatechnos. The aetiological tale —the votive basket on the Corinthian maiden's tomb, the acanthus root, and the volutes formed as the stalks bent against the tile— should be read not as history but as an aition, a foundation myth that turns a natural accident into an artistic canon. In 4.1.9 the objects the girl delighted in while alive render the Latin pauculis ('a few small things,' hence 'playthings'), the reading adopted in this edition against the poculis ('cups') of Rose and the Loeb; both go back to an old hesitation in the tradition, and the funerary context favors the former. The capital's symmetria is fixed in 4.1.11: its height equals the lower diameter of the shaft, and the diagonal of the abacus is twice that height. [The author's personal hermeneutic proposal: reading the acanthus as an emblem of regeneration belongs to symbolic interpretation, not to the Vitruvian text.]

Comparative note — IV.1. The story of the Corinthian capital is introduced as an account of invention, prima inventio ... memoratur. The reading adopted in this edition is pupulis, as in Krohn's text, referring to the objects with which the girl had played. Printed variants and different interpretations belong in the apparatus. Gros's commentary on Book IV, Granger and Rowland–Howe provide distinct philological and architectural perspectives; their interpretations should not be conflated with the evidence of an individual manuscript. The account's aetiological character remains separate from the archaeological history of Corinthian capitals.

(De architectura, 4.1.8-9)

One of the most unique characteristics of the Corinthian order is its extraordinary slenderness, usually reaching a proportion of 10 diameters in height.

In the Greek Archaic period, the worship of celestial deities or archetypes in the form of votive columns was common. These columns often culminated in a bust or appeared as simple pilasters or piles of stones, as in the case of the cult of Hermes. The name of the god Hermes derives from the Greek term herma (ἕρμα), meaning " stone " or " pillar. " Many of the deities later worshipped throughout the rest of Greece and Europe — such as Hermes (Mercury to the

Romans), Iris, and Pan — originated in the region of Arcadia, considered the " cradle of the gods. " Interestingly, the name *Arcadia* (Ἀρκαδία) can be etymologically linked to the concept of *arkhé (ἀρχή)*, meaning principle or origin, evoking the idea of " place of the beginning " or " first cause. "

A remarkable testament to the origins of the Corinthian order is the capital found in the circular foundations of the *Tholos* of Epidaurus, carefully buried in antiquity. Its magnificent state of preservation and enigmatic location have led researchers to interpret that it was intentionally placed there by a sculptor as a model for future generations of stonemasons. This example, the oldest known Corinthian capital, is currently housed in the Archaeological Museum of Epidaurus.[73]

On the Corinthian order and its possible symbolic meaning

The author proposes a symbolic association between the Corinthian order and the cultic spheres of Apollo and Asclepius, deities connected with healing and renewal. The early Corinthian column inside the Temple of Apollo Epicurius at Bassae provides a relevant comparison. Its presence does not, by itself, establish the order's origin in an Apollonian healing cult.

According to the account transmitted by Vitruvius (De *architectura* 4.1.8-9), the Corinthian capital was invented by the sculptor and architect Callimachus**.** The anecdote relates that, beside the tomb of a young Corinthian woman, a nurse placed a basket containing the deceased's toys and covered it with a square tile for protection. An acanthus root, growing beneath the basket, sent its leaves sprouting through the mesh, curving gracefully under the weight of the tile and giving rise to the characteristic shape of the Corinthian capital. This narrative, which survives only in Vitruvius's treatise, constitutes the best-known legendary explanation for the origin of the architectural order.

In the symbolic reading proposed here, the Corinthian column is compared with arboreal imagery associated with Apollo. The acanthus basket, ascending stems, and curling foliage invite an interpretation in terms of growth, renewal,

73Tholos (θόλος; plural tholoi) denotes a building of circular plan in Greek architecture. Historians also apply the term to certain circular or corbel-vaulted funerary structures, whose functions and dates vary. It should not be restricted to a single architectural type or period.

and healing. This comparison concerns the reception and meaning of the form; it does not establish descent from a particular ancient tree cult.

This interpretation finds a certain parallel in the eastward expansion of the Corinthian style. During the Hellenistic and Roman periods, the order spread across vast regions of the Indo-European world, reaching as far as Gandhara (present-day northern Pakistan and Afghanistan). In this cultural context, Corinthian columns were adapted locally and sometimes crowned with images of Buddha instead of the traditional acanthus flower, merging the classical Mediterranean form with Buddhist iconography.[74]

The Corinthian capital, the most elaborate of the three classical orders, is characterized by its plant basket shape composed of acanthus leaves, from which volutes and cauliculi emerge that support the abacus.

Hymns to Apollo

Callimachus, Hymn IV to Delos[75]

"You did not fear the wrath of Hera, who raged terribly against the mortals who gave birth to Zeus's offspring, and especially against Leto, the only goddess destined to conceive a son more beloved by the Father than Ares. From the ether, the goddess watched in person, consumed by boundless anger ... Arcadia fled from her, and the sacred mountain of Augea turned away from her."

Critical note: The passage describes Leto's wanderings throughout Greece due to Hera's curse, which forbade her from finding refuge on the mainland. The geographically detailed escape (Arcadia, Mount Augeas) is a typical feature of Callimachus's scholarship.

Philological translation and restitution

74**Gandhāra was a historical region of the north-western Indian subcontinent and neighboring territories, important in exchanges between Iranian, Hellenistic, Central Asian and Indian traditions. Its political and geographical extent varied considerably over time.**

75**Callimachus** (Ancient Greek Καλλίμαχος) (310 BC - 240 BC) was a poet and scholar, born in Cyrene and descended from a noble family.

I. The Hamadryads and Apollo's Premonition (vv. 80-100 approx.)

"The nymphs rejoice when the rain makes the oak trees grow; the nymphs, on the other hand, weep when the oak trees lose their leaves.[1] Against them Apollo, still contained in the maternal womb, was greatly indignant and inflicted this threat, which would not remain in vain, against Thebes:

"Thebes! Why, wretched one, do you defy your fate? Do not force me to prophesy against my will. The seat of the tripod on Pytho is not yet mine, nor has the great serpent died; still the monster with fearsome jaws crawls from the rock of Pleisto and inspires terror on snowy Parnassus, encircling it with the nine rings of its tail. With absolute clarity I announce it to you, with sharper clarity than if I spoke from the laurel: flee! For I will soon overtake you to wash my weapons in your blood, since the children of a proud woman have fallen to you. You will not be my nurse, nor will Cithaeron. I am pure, and only those who are pure will I pity. "

II. The birth of Leto (vv. 205–210 approx.)

"Leto untied her belt and leaned her back against the trunk of a palm tree.[4] A cold sweat ran down her body; exhausted, she finally exclaimed:

" Why, my son, do you grieve your mother? Behold, beloved son, this is the island that sails upon the sea: be born, my son, be born, and spring forth sweetly from my womb! "

III. The song of the swans (vv. 250–255 approx.)

"The goddess spoke, and the swans, singers of the god, leaving the Maeonian Pactolus, circled seven times around Delos. With their melodies they lulled the birth, for they are the birds of the Muses, the most melodious of the heavens. For this reason, the child later endowed the lyre with seven strings, as many times as the swans sang of the birth. They did not sing an eighth song, for at that very moment the god emerged into the light. "

Critical and philological notes

1. **The Nymphs and the *Trees* (*Hamadryads*):** The original text refers specifically to the *Hamadryads (nymphs* whose fate is biologically and temporally linked to a specific tree). The Greek term usually used by Callimachus is drys*, which strictly designates the holm oak or oak,* not the generic "tree. " The temporal correspondence of their lives is a classic motif in Hellenistic poetry.

2. **The restitution of *Plisto* for *Plinto*:** The original text provided contained a geographical corruption: it read " *Plinth.* " Philologically, the correct reading is **Plisto** or **Pleisto** (the river or valley at the foot of Parnassus, near Delphi, from where the serpent Python emerges: *"...apo Plistoio..."*).

3. **The talkative/arrogant woman:** The allusion to *"the talkative woman"* (*lálos*) is a direct reference to **Niobe**, the daughter of Tantalus, whose *hubris (*arrogance) in *boasting* of having more children than Leto caused Apollo and Artemis to massacre all her offspring in Thebes. The precise academic term is *pride* or *impiety*.

4. **The palm tree of Delos:** A fundamental element of Apollonian iconography. Leto gives birth while clinging to the sacred palm tree (*phoenix*) of the island of Delos (formerly called Asteria, the floating island).

5. **The meter of the swans and the lyre:** This passage from Callimachus is a **mythical etymology of the heptatonic scale**. The Greek text emphasizes the exact synchronicity between the seven turns of the swans (*kyknoi*) and the subsequent structure of Apollo's lyre.

Euripides, Ion[7677]

"O blessed Nike! [1] Come to the Pythian palace, descending in swift flight from the peaks of Olympus to the chambers where Phoebus dwells. There, on the Omphalos[2], the sacred navel that is the center of the earth, and beside the tripod revered by the choruses, the god proclaims his infallible oracles. "

Critical Notes

1. Nike and Athena: In this chorus of *Ion*, the supplicants invoke **Athena Nike (**Victory) and **Artemis** to intercede for the fertility of Xuthus and Creusa. The use of the term blessed (potnia/ makaira*)* is *a* direct *ritual* epithet.

2. The Omphalos and the Tripod: The original Greek text contrasts the fixity of the Omphalos (ὀμφαλός) — the geometric and sacred center of the

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76**Euripides (Εὐριπίδης; c. 480–406 BCE) was one of the principal tragic dramatists of classical Athens, alongside Aeschylus and Sophocles.**

77Pausanias describes the Delphic omphalos and records the tradition that located the center of the earth there. A modern paraphrase of that account should be distinguished from a direct quotation of the ancient text.

Earth — with the activity of prophecy on the tripod. The redundancy of "street" and "house" has been eliminated, unifying them under the tragic terms palace (domous) and chambers (melythra), which more accurately reflect the majesty of the sanctuary at Delphi.[78]

3. **"Produces oracles":** The original verb is usually *thespizei* or *krainei (to fulfill, decree, or prophesy sovereignly*). Therefore, *"proclaims his infallible oracles" or " seals the oracles"* better suits the rigor of Delphic prophetic language than the original formula "produces."

Pausanias, Description of Greece

"On leaving the temple and turning left, there is an enclosure containing the tomb of Neoptolemus, son of Achilles. The Delphians sacrifice to him annually as a hero. Going up from the tomb, one comes to a stone of no great size. Olive oil is poured over it every day, and at each festival it is covered with unworked wool. The tradition is that this is the stone given to Cronus in place of his child, and the same stone that Cronus later disgorged." (Pausanias 10.24.6.)

Critical Notes

1. The Delphians are the inhabitants of Delphi. They should be distinguished from the Delians, the inhabitants of Delos. The two sanctuaries belong to distinct local traditions, even where both concern Apollo.

2. The stone of Cronus and the omphalos. Pausanias describes a stone associated with the story of Rhea and Cronus, anointed with oil and covered with wool in ritual observance. This passage should be

78Mundus is the sacred space beneath an altar, in Greco-Roman culture. **Omphalos** (in ancient Greek ὀμφαλός *omphal ó s*, in German ' navel' The Navel (or Navel [elevated] center) was a cult stone in the Adyton of the Temple of Apollo at Delphi. It was covered with woolen garlands (*agrenon*) and marked the " navel of the world." A Hellenistic or Roman marble copy of the stone is now in the Archaeological Museum of Delphi. The term is also used as a synonym for *center* and event center.

distinguished from the separate traditions and representations of the Delphic omphalos; identifying the cult objects requires further evidence.

3. **The myth of Cronus and Rhea:** This passage alludes to the Hesiodic theogonic myth. Rhea tricked Cronus by giving him a stone wrapped in swaddling clothes (the *Abadir*) to save the newborn Zeus. When Cronus vomited it up, the stone became fixed in the "center of the world" (Delphi) as a cosmic axis.

The author's symbolic reading. The coexistence of sacred stones, ritual practices, and built monuments at Delphi permits a comparison between natural matter and architectural form. In the interpretation proposed here, the stone associated with Cronus and the measured forms of the sanctuary suggest different modes of sacred order. Pausanias's description does not itself prescribe a pilgrim's passage from "chaos" to "cosmos"; that movement is the author's hermeneutic construction.

Hyginus, [79]Fables

Elevate this mythographic fragment to a strictly academic and philological level, it is necessary to correct the inconsistencies in the nomenclature (such as the mixture of Greek and Roman theonyms: *Apollo/Latona* versus *Jupiter /Neptune*) and to specify the classical sources that collect this tradition (such as the *Fables of* Hyginus, Fables 53 and 140, from where this structural variant of the myth comes).

Philological translation and restitution

"Python was a serpent of colossal proportions, born from the Earth[1] before the birth of Apollo. This creature used to deliver oracles on Mount Parnassus, the place where, according to fate, it would meet its death when Leto[2] gave birth. When the serpent learned that the goddess had conceived by Zeus[3], it pursued her with the aim of killing her; however, by order of the sovereign of the gods[4], the North wind Aquilon rescued Leto, leading her before Poseidon, who granted her protection. Python, unable to find her, returned to Parnassus. Four

79**Gaius Julius Hyginus, active in the Augustan period, was a scholar and librarian. Traditions about his origins are late and contradictory; birth in Hispania should not be asserted as an established fact.**

days after his birth, Apollo avenged the wrongs done to his mother: he went to Mount Parnassus and killed the serpent with his arrows. As a result of this feat, he received the epithet Apollo Pythios." He then placed the monster 's remains inside a tripod within his sanctuary and, to commemorate this event, instituted the funeral games known as the [80]Pythian Games.[5]

Critical notes and exegesis

The chthonic nature of Python: The text emphasizes that the serpent is born from the Earth (*Gaia). In* Greek mythology, Python personifies the primordial chthonic forces that guarded the ancient oracle of Themis at Delphi before the arrival of the Olympian *order*.

4. Theonymic homogenization (Leto/Zeus/Poseidon): The original manuscript presented a confusing syncretic hybridization by alternating Greek and Latin names (*Latona* for Leto, *Jupiter* for Zeus, *Neptune* for Poseidon). Philologically, since it concerns the mystical cycle of Delphi, the regular Greek nomenclature should be maintained, reserving Latin only when explicitly citing a Roman author such *as* Hyginus or Servius.

5. The North Wind and Poseidon's Intervention: The mythographic variant that introduces the north wind (Boreas / Aquilon) and Poseidon's concealment of Leto (who covers the floating island of Ortygia/Delos with his waves to deceive Hera) comes directly from the tradition of Hyginus (*Fabulae*, 140). It is an exact copy of the textual source you are using.

6. The logical correction of the narrative: The pursuit is instigated by the jealousy of **Hera** (June), while Zeus (Jupiter) seeks to facilitate the escape across the North Wind. The meaning of the sentence has been restored by indicating that the rescue — and not the pursuit — was carried out by order of the sovereign of the gods.

7. The etymology of the Pythian Games and the Tripod: The consecration of the serpent's remains within the oracular tripod endows the object with the dimension of a sacred relic. The Pythian Games, in their

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80In **Greek mythology, Leto** (Ancient Greek: Λητώ Lêtố, Doric: Lato, 'forgetfulness') is a daughter of the Titans Coeus and Phoebe, and, in the Olympian pantheon, mother with Zeus of the twins Apollo and Artemis. In Roman mythology, her equivalent, as mother of Phoebus and Diana, is Latona. With her sister Asteria, she was venerated as a goddess of the night and alternately of daylight.

mythical origin, were not profane athletic competitions, but rather funeral *contests* intended to appease the spirit of the defeated chthonic creature, transforming the monster's tomb into the axis of the oracle.

Homeric Hymn III to Apollo[81]

It was then, too, that Phoebus Apollo considered which men he would take there as officiants to celebrate his cult on rocky Pytho. While he pondered this idea, he saw a swift vessel upon the wine-dark sea. On board were many valiant men, Cretans from Minoan [82]Knossos, who celebrate the rites in honor of the Sovereign and proclaim the oracles of Phoebus Apollo, he of the golden weapon: all that he foretells from the laurel at the foot of the gorges of Parnassus. They, for their business and profit, were sailing in a black ship towards Pylos, the sandy one ... But Phoebus Apollo came out to meet them.

Callimachus, Hymn II to [83]Apollo

Apollo's dress is golden, the golden brooch adorns his shoulders, as well as his quiver and Lyctian bow, his sandals are also golden, for Apollo is all goods and gold, you will be able to verify this in Pytho, certainly, he is always beautiful, as well as always young.

On the ground they sprinkle their curls of hair, aromas full of fragrances, their strands of hair, produce Apollo, not an ointment, but the cure for all things, on that city where those drops fall nothing can ever die.

Apollo, encompassing all with his skill, has gathered all the conditions upon himself, as the bard to Phoebus[84], so the bow and the song are entrusted

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81**The philosopher's sun**, the light of intellect in Etruscan culture, is known as Apulu. In Greece, it was associated with immortality and represented as a cube.

82The place where **Python**, the Serpent, was buried.

83Callimachus (Ancient Greek: Καλλίμαχος) (310 BC – 240 BC) was a poet and scholar, born in Cyrene and descended from a noble family. He was commissioned by Ptolemy II to organize the Library of Alexandria, a task he carried out until his death. His work was so significant that he is considered the father of librarians (or at least of catalogers). His Pinakes (Tablets), 120 volumes containing the complete catalog of the Library arranged chronologically, were of enormous value to subsequent bibliographic and literary studies of the Classical period.

84Another name for the god **Apollo**, in Delphi he was known as Apollo Phoebus.

to him, the Pythia, by divine grace of the God Phoebus, have taught the doctors of non-death.

Apollodorus, Library I[85]

Apollo also killed Marsyas, the son of Olympus. Marsyas found the flute that Athena had rejected because it marred her face, and he tried to emulate Apollo in the art of music. Having agreed that the victor would dispose of the vanquished as he pleased, when the contest arrived, Apollo competed with the inverted lyre and invited Marsyas to do the same.

Pausanias Book X[86]

"Indeed, they say that in ancient times the oracle (of Delphi) belonged to Gaia and that she appointed Daphne, who was one of the nymphs of the mountain, as prophetess."

“The oldest temple of Apollo was made of laurel wood, and the branches were brought from the laurel forest near the temple. This temple would have had the form of a hut; his second temple was made of a honeycomb and feathers; this was sent to the Hyperboreans by Apollo.”

Ovid, Metamorphoses 1.452–567, an abridged rendering[87]

Apollo's first love was Daphne, the daughter of Peneus. This was not a product of chance, but of Cupid's planning: " Though your bow pierces everything else, mine will pierce you. " He spoke and took from his quiver arrows with different effects; one makes love flee, the other produces it. The one that produces it is

85**Apollodorus of Athens, a second-century BCE grammarian and scholar, studied under Aristarchus of Samothrace. He must be distinguished from the anonymous or pseudonymous author of the mythographical work transmitted as the Bibliotheca of Apollodorus.**

86**Pausanias was a second-century CE Greek traveler and writer, author of the Periegesis Hellados (Description of Greece), a major source for Greek topography, sanctuaries and local traditions.**

87Ovid’s Metamorphoses is a Latin poem in fifteen books recounting transformations from the world’s beginnings to the deification of Julius Caesar. The Greek word μεταμόρφωσις means ‘transformation’; it is a Greek expression, not a Latin transcription. The poem was completed around 8 CE and exerted a lasting influence on later European literature and art.

made of gold, and its sharp point gleams; the one that makes it flee is blunt and has a shaft tipped with lead.

Cupid struck Daphne with the lead-tipped arrow and pierced Apollo with the golden one. She shunned love, while he was consumed by it. He pursued her, driven by hope; she fled, driven by fear. When her strength failed, she looked toward the waters of Peneus and prayed: "Help me, Father. If your waters have divine power, change and destroy the form by which I have pleased too well." Scarcely had she finished when a heavy numbness seized her limbs. Her soft breast was enclosed in thin bark; her hair became leaves and her arms branches. Her once-swift feet took root, and a treetop replaced her head. Only her beauty remained. Apollo then declared: "Since you cannot be my wife, you shall at least be my tree."[88]

Euripides, [89]fragment

"Oh, Apollo! 1 Oh, god of crossroads, my destroyer! 2 For you have utterly destroyed me without any effort. With good reason mortals call you Apollo, for your name signifies my doom 3."

88In Greek mythology, **Peneus** (Greek: Πηνειός) was a river god and one of the three thousand rivers. He was the son of Oceanus and Tethys. With the nymph Creusa, he had four children, including Hypseus, king of the Lapiths, and three daughters: Cyrene, Daphne, and Stilbe. However, according to other sources, Cyrene is considered one of his wives. Stilbe bore twin sons to the sun god Apollo: Centaurs and Lapith, the latter being the namesake of the Lapith people. Eros, the Greek god of love, shot an arrow at Apollo so that he would fall in love with Peneus's daughter, Daphne. According to the myth, Eros's purpose was for Daphne to scorn Apollo, as revenge for Apollo's mockery of her skill with the bow. Consequently, Daphne implored Peneus, the river god, for help, and he transformed her into a laurel tree, which from that moment on would be sacred to Apollo. In an Arcadian version of the myth, Daphne was the daughter of the god Ladon.

89**Euripides (Εὐριπίδης; c. 480–406 BCE) was one of the principal tragic dramatists of classical Athens, alongside Aeschylus and Sophocles.**

From a critical and philological standpoint, it is necessary to clarify that, although this fragment is preserved independently in various anthologies and ancient treatises, it does not formally belong to a lost work by Euripides, but is a variant or indirect quotation of the famous passage from ***Aeschylus ' Agamemnon*** (vv. 1080–1082) that later tradition (such as the scholium to Euripides or mythographic treatises) used to cross due to the tragic identity of Cassandra.

Philological translation and restitution

Critical Notes for the Exegetical Apparatus

1. **The invocation and the pain (*Apollon, Apollon*):** The original text is not a lyrical apologia to the "beautiful Sun" in a celebratory sense; it is a cry of sacred terror. Cassandra invokes the god of light on the threshold of death. The confusion with the "Sun" (*Helios*) stems from the late Hellenistic assimilation (common in Euripides ' treatment of the god in tragedies such as *Phaethon)*, where sunlight is directly associated with Apollo's destructive rays.

The epithet Agyieus (Ἀγυιεύς): In the original Greek, the text alludes to Apollo Agyieus, the protector of streets, entrances, and gates. In front of the palace of Mycenae stood a conical pillar or baetylus representing the god. For the prophetess, however, this pillar is no longer a symbol of architectural protection; instead, it has become the boundary marker that delimits the space where she will be sacrificed.

The philological core: the mythical etymology (Apóllymi): This passage contains one of the most famous etymological puns in Greek tragedy. There is a deliberate homophony between the name of the god Apollo (Ἀπόλλων) and the verb ἀπόλλυμι (*apóllymi*), which means “to destroy,” “to annihilate,” “to ruin,” or “to kill.” When the text declares that “mortals rightly call you Apollo,” it enacts a linguistic revelation: the god of harmony and order is, for the one who suffers his severity, “The Destroyer.”

The basilica of Ordona

The Basilica of Ordona (ancient *Herdonia*, in Apulia, Italy), erected during the reign of Emperor Augustus at the end of the 1st century BC, is one of the most significant archaeological examples for the study of the Roman basilica typology. In architectural historiography, this building is analyzed in close

parallel with the famous Basilica of Fanum *Fortunae* (Fano), the only structure that Vitruvius himself claims to have built in the *Colonia Julia Fanestris* and which he meticulously described in Book V of his treatise *De architectura*. Although the Basilica of Ordona is currently in ruins, its epigraphic and monumental remains allow us to study the materialization of the imperial canon.

As with Vitruvius's testimony regarding *Fanum* — where the architect acknowledges having altered the symmetrical proportions of the theoretical model to adapt to the existing conditions and needs of the forum — the basilica of Ordona demonstrates a clear architectural adaptation to the topographical characteristics of the terrain and the pre-existing urban layout.

Addendum (2026, preliminary data): The archaeological discovery of the Fano basilica. For centuries, the basilica of Fanum Fortunae existed only in the words of Vitruvius himself (De architectura 5.1.6-10), the only work the author claims to have personally designed and directed. In January 2026, however, preventive excavations associated with the renovation of Piazza Andrea Costa in Fano, as part of a project funded by the Italian National Recovery and Resilience Plan (PNRR), unearthed the remains of a large public building whose plan, proportions, and colonnade remarkably match Vitruvius's description. The Superintendence of Archaeology, Fine Arts and Landscape of Ancona and Pesaro-Urbino, together with the Vitruvian Studies Center and the Polytechnic University of Marche (P. Clini), announced the identification: the excavated remains occupy, on site, approximately 50 by 35 meters — a provisional figure, pending the completion of the dig — with a rectangular floor plan and a perimeter colonnade, and one of its columns, reconstructed from its diameter, would measure about 1.47 meters—approximately the five Roman feet that Vitruvius prescribed for the columns of his basilica. Publicly announced on 19 January 2026, and still the subject of ongoing excavation and study, the discovery has been widely hailed as the first direct material evidence for a work by Vitruvius; should the identification be borne out by the full publication of the

excavation, it would at last connect his written theory with his built practice.

Documentary update — Fano. The Italian Ministry of Culture's announcement of 19 January 2026 identifies the Piazza Andrea Costa remains as Vitruvius's basilica, while noting that investigation would continue. That institutional identification should be distinguished from preliminary field estimates and from the ancient building's textual or ideal proportional reconstruction. See Ministero della Cultura, 'Scoperta Basilica di Vitruvio', 19 January 2026, https://cultura.gov.it/comunicato/28580.

Sources and chronology of the 2026 discovery. The identification was announced on 19 January 2026 in Fano by the Soprintendenza and Italy's Ministry of Culture. Vitruvius describes the basilica as his own completed work in 5.1.6–10. The date of that building must be considered alongside the debated chronology of the treatise's composition and circulation. A completion date reported in the press cannot establish either chronology; the excavation and its full publication must supply the archaeological controls.

Armellini, Alvise. "Italy Uncovers Basilica Designed by Vitruvius, the 'Father of Architecture.'" Reuters, January 19, 2026.

"Basilica of Vitruvius Found in Fano: A Discovery of Extraordinary Importance." Finestre sull'Arte, January 19, 2026.

Soprintendenza Archeologia, Belle Arti e Paesaggio per le province di Ancona e Pesaro-Urbino, and Ministero della Cultura. "Identification of the Basilica of Fanum Fortunae Described by Vitruvius." Press announcement, Mediateca Montanari, Fano, January 19, 2026.

Critical and historiographical notes

Geographical clarification (Fano vs. Ordona): It is vital to disentangle the claim that Vitruvius's basilica was built in Ordona. Vitruvius was explicit: his basilica was in *Fanum Fortunae*. Ordona's significance lies in the fact that its Augustan basilica is contemporary with Vitruvius's writings and demonstrates how the plan model with an internal colonnade and tribunal was becoming standardized in Roman Italy.

3. Chronology. Augustus ruled from 27 BCE to 14 CE. Vitruvius's activity belongs to the late Republic and the early Augustan period; this context does not establish an exact date for every building discussed in the treatise.[90]

The basilica at Fanum Fortunae is described by Vitruvius as a building he designed and supervised (5.1.6–10). Its reconstruction has long been debated through comparison with the text and other Roman basilicas. On 19 January 2026, the Italian Ministry of Culture announced the identification of the remains in Piazza Andrea Costa, Fano, as Vitruvius's basilica. That institutional identification must be distinguished from the continuing excavation, the full publication of the evidence and the assumptions embodied in modern reconstructions.

Located directly adjacent to the forum, a proportional reconstruction from the sesquialtera (3:2) ratio prescribed by Vitruvius himself yields a basilica of about 144 by 96 Roman feet (approximately 42.65 by 28.43 meters); this idealised modular figure should be distinguished from the provisional on-site measurement of the excavated remains noted above. The architectural program also incorporates an internal peristyle of thirty-two tubular columns. However, archaeological evidence and the literary passage itself reveal a substantial divergence from the theoretical basilica model: the integration of an *Aedes Augusti*, or temple dedicated to the imperial cult, into its rear flank. This insertion altered the traditional axial symmetry of the Roman building by displacing the classical tribunal, demonstrating that the material execution of the *cubus* and the architectural order was flexibly adapted to the demands of the terrain's topography and the pre-existing political and religious conditions of the urban space.

Critical Notes

• **The modular ratio (3:2):** In classical philology and ancient architecture, instead of the simple mathematical expression "3x2 proportions", the classical technical term sesquialtera ratio **is preferred (where** one whole

90 A ***aedes***, in the In the religion of Ancient Rome, it was the dwelling place of a deity. In principle, it was any structure that housed the image of the deity, and therefore, imbued with a sacred character, distinguishing itself from the *temple* or sacred precincts properly speaking.

Reference: John W. Stamper, The Architecture of Roman Temples: The Republic to the Middle Empire Cambridge University Press, 2005, p. 10.

contains another one and **a** half times, i.e., 1.5 or 3:2). This significantly increases the rigor of the geometric description.

• **The *Aedes Augusti* as a point of rupture:** The presence of the *Aedes Augusti* over the adaptation of the canon. Vitruvius breaks the regularity of the central colonnade to open an exedrae space in front of the emperor's temple, thus uniting the civil function (basilica) with the sacralization of the State (imperial cult).

Latin word *fanum* properly designates the "sacred place" or the "sanctuary" consecrated to a deity. From this root derives the adjective *fanaticus*, a term that originally referred to a temple servant or one who manifested an ecstatic enthusiasm provoked by the proximity of the deity; it was only with historical development that the word acquired the pejorative connotation of intransigence that it retains today. In contrast, everything that remained outside the walls of the sacred precinct was called *pro-fanum*, the direct origin of the modern concept of "profane," which delimits the realm of the secular from the sacred.

Beyond the biographical outlines of Marcus Vitruvius Pollio — scarce, fragmentary, and difficult to verify historiographically — this study focuses on his crucial theoretical and practical contributions to the field of architecture. His treatise exerted a decisive influence on construction practices and architectural writing from the Middle Ages to the Renaissance, maintaining an undeniable epistemological relevance. To understand the scope of his work, it is essential to contextualize the author within the late Republic and the early Principate of Rome, a chronological arc spanning the dictatorships of Julius Caesar (49–44 BCE) and the reign of Octavian Augustus (27 BCE– 14 CE). It should be noted that, within the catalog of Roman-era structures that survive today, no epigraphic or archaeological documentation remains that would allow any work to be formally attributed to him. The only exception to this monumental void would be the Basilica of Fanum Fortunae (Fano), in northern Italy; in Book V of his treatise De architectura, Vitruvius himself offers a detailed description of a basilica of his own design built in that colony. Although architectural historiography often establishes fruitful formal parallels between this Vitruvian model and the Basilica of Ordona (in Apulia), it must be clarified that in the current archaeological record of Fano, no substructural remains have

been found that coincide unequivocally with the literal description given in the treatise.

Critical Notes

1. Clarification of the concept *Fanaticus*: The redefinition of the term cleanses the text of a modern sociological interpretation ("sacralizing everyday life") and restores it to its true Roman religious origin: the fury of the priests of the temples (*fana*).

2. Fano and Ordona should not be confused. The basilica at Herdonia (Ordona, in Apulia) is adduced here only as a typological parallel for the study of the Roman basilica; the basilica that Vitruvius states he designed and built (De architectura 5.1.6–10) stood at Fanum Fortunae (Fano), and nowhere else. The recent excavations at Fano remain under study, and the identification, though promising, is not yet certain.

3. Unification of chronology: The temporal indication of the transition from Republic to Empire has been refined using the precise historical concepts of Roman historiography: *the end of the Republic and* the *beginning of the Principate*.

"In Book V of *De architectura*, Vitruvius establishes the modular coordinates that should govern the plan of the forensic basilica, determining that the harmonic ratio between its length and width should range between a maximum of 3:1 and a minimum of 2:1. Immediately after establishing this theoretical framework, the author introduces the description of the Basilica of Fano as an advanced design paradigm that subverts and refines these very rules. In this project, Vitruvius assumes an operational role that transcends mere theoretical speculation, directly involving himself as the architect in charge and supervisor of the construction; this is attested to by his own first-person statement: *'conlocavi curavique faciendam '* ("I myself awarded the contract and saw to its execution")."[1] This personal involvement makes the passage the only autograph testimony where the author confronts his canonical principles with the vicissitudes and material contingencies of the actual work".

Critical Notes

1. The translation of *Conlocavi* (*collocare*): In the Roman administration of public works (locatio *-conductio*), the magistrate or delegated architect *colloca* (assigns the funds and the contract to the builder) and *curat*

(exercises the *cura*, inspection, or superintendence of the State). Therefore, the translation "I settled in " shifts the technical meaning of the text towards an erroneous biographical interpretation. The correct formula denotes both administrative and technical authority.

2. **The tension of proportions:** The theoretical Vitruvian basilica should be between two and three times its width. However, when describing Fano, Vitruvius adopts a proportion of **1.5 (the sesquialtera ratio, or 3:2)** in its central navigable space, compensating for the height of the columns to maintain *eurythmia*. The canon is flexible, and the metric adapts to the requirements of the *Aedes Augusti*.[91]

"As Pierre Gros points out [92]in his reliable critical exegesis of Vitruvius's text, the plan of the Basilica of Fano projects a compact rectangle that tends ostensibly towards quadrature, a morphological phenomenon that finds a clear precedent in the Basilica of Cosa (Tuscany). Far from constituting an anomaly, this dense and integrated spatial configuration became a fully typified typological constant during the principate of Augustus. However, the true discontinuity of Fano with respect to the preceding republican models lies in the bold assimilation of new prerogatives of a political-ideological nature. Vitruvius describes the insertion of an apse with a semicircular curvature arranged on the axis of one of the longer sides of the building, axially facing the main entrance; This exedrate space housed the tribunal and was formally consecrated as *Aedes Augusti*, thus becoming the monumental nucleus of the imperial cult within the basilica's civil space.

Critical Notes

1. **The typology of Cosa and Fano: The reference to the Basilica of Cosa (a colony founded in 273 BCE) is a historiographical insight by Gros. Cosa presents a floor plan much closer to a square than the late Republican basilicas of Rome. Fano elaborates on this evolution: by shortening the long sides, the interior space becomes monumental, and**

91 Roman colony of Cosa (nr. Ansedonia) in Italy. The construction is made of concrete (opus cementicium) covered with irregular stones (opus incertum).

92Pierre Gros, an important editor and commentator on Vitruvius in the Collection des Universités de France, is cited here for his work on Roman architecture and the interpretation of De architectura.

the viewer perceives the colonnade not as an endless corridor, but as a unified and centralized enclosure.

2. **The *Aedes Augusti* as an axial rupture:** Traditionally, the tribunals of basilicas were located on the short sides (longitudinal axis). By shifting the apse of the tribunal to the center of one of the long sides (transverse axis) and merging it with the *Aedes Augusti*, Vitruvius completely alters the flow of movement and the citizen's perspective. The civic building becomes a visual propaganda apparatus: upon entering, the first thing one encounters is the statue or altar of the emperor.

"Through the meticulous description of this *Aedes Augusti*, Vitruvius holds the historiographical merit of having codified the semantic function of the monumental apse in close symbiosis with the civil basilica, configuring a space of strong ideological charge that projects the imperial *auctoritas* and disseminates a profoundly innovative typological program through the architecture of the State."

As for his treatise *De architectura*, written and dedicated specifically to the Emperor Augustus, its value transcends its immeasurable subsequent influence; its exceptional status lies in being the only theoretical corpus of architectural tradition from classical antiquity that has survived intact to this day. Rigorously structured in ten books, the treatise addresses in its Book I the very ontology of the discipline, postulating the celebrated triad upon which constructive practice rests: *firmitas* (structural solidity), *utilitas* (spatial functionality), and *venustas* (beauty and eurhythmy). While successive volumes are devoted to the science of materials (Book II) or to the morphology and arrangement of the temples of the immortal gods (Book III), the text is not limited to mere technical prescription, but rises to a profound philosophical speculation on cosmic symmetry, musical harmony, and anthropomorphic modulation. Vitruvius summarizes this theory of the cosmic - human analogy with famous words:

" For no building can have a sense of composition without symmetry and proportion, unless it has an exact proportion like that of the limbs of a well-shaped man."[1]

("For no temple can possess an ordered compositional structure without symmetry and proportion—that is, unless it maintains an exact modular analogy with the members of a harmoniously configured human body").»

Critical notes

1. Clarification of the term Rationem (Analogy /Reason): In Vitruvian Latin, *ratio* is not simply an abstract mathematical "reason "; it is the method of calculation and the internal logic that unifies the parts with the whole. When translated in the context of sacred geometry, the **more** precise terms are **modular analogy** or **geometric concordance**.

2. The Vitruvian triad: It is essential to maintain the Latin terms in italics (*firmitas, utilitas, venustas*) to preserve the rigor of the theoretical framework. Within the context of this edition, *venustas* is not superficial ornamentation, but rather the mathematical result of applying the symmetry of the human body and musical consonances to the building plan.

3. The human body as the matrix of space: The final quote is the foundation of the **Vitruvian Man** theory; this demonstrates that the Roman temple is not an isolated object, but a microcosm: Apollonian architecture takes the perfect measurements fixed by nature in the human body and transfers them to stone using the ruler and compass.

In Vitruvius's metrological account, parts of the human body provide units related by proportion. The finger, digitus, is the smallest of the units listed here. Four fingers make a palm, palmus, and four palms make a foot, pes. The Roman foot therefore contains sixteen fingers.

The reception of Vitruvius's anthropometric canon raises questions about the relation between textual ratios and observed anatomy. In 3.1.2, Vitruvius distinguishes the distance from the upper chest to the hairline, one-sixth of the total height, from the distance to the crown, one-quarter. These endpoints must not be conflated. Leonardo's accompanying notes give the foot as one-seventh of the body's height, rather than Vitruvius's one-sixth; his drawing should therefore be studied as an independent investigation as well as a response to the ancient text.

Encyclopedic program in Book X, devoted to civil mechanical engineering and siege warfare or military weaponry. Among the devices described, the vertical wheel and paddle watermill stands out for its incalculable socioeconomic significance, its technological diffusion shaping milling in Western Europe and, later, in the Americas.

Architecture and the column as a reflection of the human body

The fundamental postulate of Vitruvius's treatises lies in the fact that architectural structures should be designed according to the same laws of symmetry and proportion that govern the *" body of a well-formed man "* (*De architectura*, III, 1, 1). This analogical correspondence finds its highest material expression in the evolution of the classical orders, where the column is not conceived as a mere tectonic support, but as a direct anthropomorphic transposition: the Doric column embodies the robustness, proportion, and strength of the male body, while the Ionic and Corinthian columns translate the slenderness, delicacy, and ornamentation associated with the female physiognomy.

Critical Notes

1. Roman metrology. In the Roman system of measurement, the *palmus* was not equivalent to a finger (*digitus*). Rather, the standard relationship was: one *pes* (Roman foot) equalled four *palmi* (palms) or sixteen *digiti* (fingers). Consequently, one *palmus* corresponded to four *digiti*. Textual and Metrological Note

2. **The precision of Ortiz y Sanz:** The Spanish neoclassical academic José Ortiz y Sanz (1787) made a rationalist critique of Vitruvius based on the dissection and observation of real bodies, marking the Enlightenment's break with the blind acceptance of ancient texts.

3. Leonardo's construction uses two centers: the navel for the circle and a point near the groin for the square. Vitruvius explicitly identifies the navel as the center of the circle and equates the span of the arms with bodily height. He does not require the two figures to share a single center. Leonardo's drawing is therefore an interpretation of the transmitted instructions; the difference between its centers does not by itself demonstrate that the Latin text was geometrically mistaken.

[93]Among the early attempts at graphic reconstruction of the Basilica of Fano, the seminal contribution of Fra Giocondo stands out, author [94]of the first illustrated edition of Vitruvius's work in 1511. Giocondo's reconstruction

93 The **peristasis**, whose name comes from the Greek "περίστασις" which means "space around," refers to a colonnaded portico that surrounds the cella of a peripteral temple, common in both the architecture of Ancient Greece and that of Roman temples.

focuses primarily on the development of the floor plan, adopting a rigorous 2:1 modular ratio between its length and width. According to his interpretation, the building's internal colonnade was articulated by an arrangement of four columns on its shorter sides, eight in the intercolumniation of the long northern side, and six on the southern side. In this layout, the North wall incorporated a notable axial opening aligned with the *Aedes Augusti*; Fra Giocondo conceived the latter not as an integrated exedra, but as a freestanding and independent architectural structure, formalized according to the typology of a rectangular peripteral temple. However, the humanist substantially altered the Vitruvian text by shifting the apse of the tribunal towards one of the short sides of the basilica, contravening the explicit transverse location (on the long side) prescribed by the Latin treatise writer; a conscious amendment that reflects the theoretical debates of the architectural synod of the 16th century in the face of the apparent inconsistencies of the original manuscript.

In contrast to Giocondo's proposal, the critical edition and commentaries *of* Daniele Barbaro (1556) —enriched with the masterful engravings of Andrea Palladio — offered a philological solution more faithful to the Vitruvian canon. Barbaro's proposal restores the central colonnade, respecting the sesquialter and longitudinal proportions of the space, flanked by an ambulatory or perimeter portico with a span of twenty feet. It also faithfully places the semicircular apse of the tribunal on the symmetrical axis of the longer side, preceded by a *pronaos* that organically unifies the civic space of the basilica with the sacred precinct of the imperial cult.

Critical notes exegetical and bibliographical apparatus

1. Clarifying the error regarding the *peristasis*: By correcting "external peristasis" to " ***internal*** **colonnade**," the text regains archaeological coherence. A basilica with columns on the exterior would have been a temple,

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94 **Fra Giovanni Giocondo** (born around 1433 in Verona and died in 1515) was a prominent Italian figure who played multiple roles throughout his life. Initially a religious figure and teacher, he distinguished himself especially as a scholar dedicated to the study of classical antiquity. Over time, he broadened his interests and became an eminent antiquarian, archaeologist, military engineer, and architect. His most notable legacy lies in being one of the first printers of Vitruvius's "De architectura," contributing significantly to the preservation and dissemination of this fundamental work.

not a covered forum. What Fra Giocondo depicts is an internal framework of columns to support the double-height roofs (*clerestory*).

2. **The Barbaro-Palladio partnership:** In the history of architectural treatises, it is essential to mention that Daniele Barbaro's *Commentaries* on Vitruvius (published in Venice) cannot be understood without **Andrea Palladio's drawings. Palladio was the one who** geometrically solved the problem of the *Aedes Augusti* on the long side, applying for the first time a solution that integrated the triumphal arch into the transept, a discovery he would later apply in his own Venetian churches (such as San Giorgio Maggiore).

Daniele Matteo Alvise Barbaro (Venice, February 8, 1514 – *ibid.*, April 13, 1570) was one of the most outstanding figures of Venetian humanism in the 16th century. Although he developed a preeminent ecclesiastical career after being appointed Patriarch-Elect of Aquileia in 1550, his universal renown lies in his multifaceted nature as a scholar, philosopher, mathematician, and art theorist.

Barbaro's most significant intellectual legacy lies in architectural treatises and the science of vision. In 1556, he published his monumental *I dieci libri dell'architettura di M. Vitruvio*, an annotated translation that established the philological standard for Vitruvius's text thanks to his close collaboration with the architect Andrea Palladio. Simultaneously, Barbaro expanded the boundaries of geometric representation in his celebrated treatise La pratica della *perspettiva* (1568), where he rigorously analyzed the laws of conic projection and anamorphosis. In this field, his empirical experiments with the camera obscura proved pioneering for the history of science, introducing for the first time a biconvex diaphragm to correct chromatic aberrations and optimize the sharpness of the projected image, prefiguring the principles of modern photographic optics.

These successive hermeneutical approaches — from Fra Giocondo's pioneering schemes to Barbaro and Palladio's rigorous readings — demonstrate that the reconstruction of the Basilica of Fano has not been a univocal process. On the contrary, the building's restoration has operated as a field of theoretical experimentation throughout the history of architecture, where each designer and philologist has projected their own aesthetic, scientific, and spatial assumptions onto the suggestive gaps in the original text.

Critical notes, bibliographic and methodological apparatus

1. **Ecclesiastical precision:** Replacing "rank of cardinal" with Patriarch - **Elect of Aquileia** avoids a serious historical inaccuracy**.** In the Venetian context, the Patriarchate of Aquileia was a strategic political-religious office that the Republic of Venice zealously controlled against direct influence from Rome.

2. **Optics unified with geometry:** Including the nature of his optical experiments. For Barbaro, perspective, architecture, and the camera obscura lens were manifestations of the same universal law: **the projection of light through ordered geometric lines.** The same rigor he used to focus light in the camera obscura was the same he applied, along with Palladio, to order the axes of the Vitruvian basilica.

3. **Bibliographical context. The interpretation of this passage should be considered alongside the work of Pierre Gros and the cited study by F. Salatin (2012), particularly in relation to the chronological and architectural debate involving Fra Giocondo, Palladio, and the Ferrarese tradition.**

"Ultimately, the encounter between Daniele Barbaro's philological rigor and Andrea Palladio's geometric maturity allowed the Basilica of Fano to be restored as a coherent three-dimensional space. The basilica ceased to be a confusing succession of literary measurements and became, in the engravings of 1556, a structure where forensic light and the *Aedes Augusti* are integrated into a unified proportional system. Through optics and treatises, Barbaro demonstrated that the Vitruvian *cube* was intelligible because it participated in the same laws of universal geometry that govern the human eye and the light of the cosmos. "

rigorous academic historiographical and biographical apparatus, it is necessary to correct several phonetic and onomastic distortions in Latin names (such as "C. Giulio" for Gaius Julius, or "Massimissa" for Masinissa), as well as to clarify the interpretation that the scholar and enlightened **Berardo Galiani** (in his famous translation and commentary of Vitruvius of 1758) makes about the social networks of the Roman architect.

" In the preface to his work, Vitruvius declares that he held responsibilities in the manufacture and maintenance of the state war machine (*apparatio tormentorum*) in close collaboration with three military engineers: Marcus

Aurelius, Publius Numisius, and Gnaeus Cornelius. The scholar and intellectual Berardo Galiani, in his influential 18th-century critical edition, identified this circle of collaborators as citizens originally from Formia, a solid prosopographical correlation that has served to support the hypothesis of the author's own birth in that town in Campania."

This conjecture finds significant archaeological support in the figure of Publius Numisius, the architect whose documented authorship includes the monumental theater of Herculaneum. Architectural historiography has revealed remarkable typological and structural parallels between this Herculaneum building and the Roman Theater of Formia, suggesting the existence of a regional school or building tradition shared by Numisius and Vitruvius.

Furthermore, Vitruvius's text reveals a profound geographical and technical familiarity with the southern Latium region, manifested in his precise descriptions of the Pontine Marshes and the physicochemical properties of the thermal waters of Terracina (Neptune's spring). This topographical proximity is further reinforced by his mention of prominent figures from the local aristocracy and late Roman intellectual circles, such as Marcus Terentius Varro and Licinius Murena, whose property holdings and influence in the Gulf of Gaeta area strengthen Vitruvius's place within the social fabric of the Formia elite.

Equally revealing is the episode linking the architect to the retinue of Gaius Julius, son of Masinissa[1], the celebrated Numidian monarch. This international contact not only illustrates Vitruvius's high technical status within the Caesarian administration, but also demonstrates the integration of Roman engineers into the diplomacy and high politics of the Neo- Hellenistic Mediterranean. Although the debate surrounding Vitruvius's *birthplace remains open within the discipline, with historical candidates such as Verona, Fano, or Fondi alternating, the density of epigraphic and geographical evidence linked to Formia lends this hypothesis a high degree of scientific plausibility, shaping the human* backdrop from which the universal knowledge compiled in *De architectura would be projected*.

Critical Notes

Onomastic note. Vitruvius names Gaius Julius, son of Masinissa, in 8.3.25. Identification of the persons concerned requires chronological and prosopographical evidence; the name alone does not establish a meeting with the famous Numidian king who was Rome's ally in the second century BCE.

4. Prosopographical note. The architect Publius Numisius is associated with the theater at Herculaneum in epigraphic discussion. His identification with the P. Numisius named among Vitruvius's military colleagues in the preface to Book I requires evidence beyond the shared name. The theater must also be distinguished from an amphitheater.

5. On the Formian hypothesis. Galiani's discussion of Vitruvius's origins belongs to the history of scholarship. Family names and regional associations may support a geographical hypothesis, but they do not independently establish the author's birthplace. The proposal should be compared with the ancient testimonies and with securely identified inscriptions.

The proposed connection with Formiae offers one possible regional setting for Vitruvius's technical experience. The treatise itself demonstrates familiarity with materials, construction and hydraulic problems, but it does not document membership in a specifically identified Campanian guild. The association of that practical knowledge with the cubic ratio and a cosmic order is the author's interpretive proposal. It should remain distinct from the biographical evidence.

1. Primary Sources and Critical Editions (Classical Antiquity)

• **Aeschylus.** (2009). Agamemnon. (Critical edition by Christopher Collard). Oxford: Oxford University Press.
— Note: Fundamental source for the restoration of the Cassandra passage and the exegesis of the etymological wordplay between the theonym Apollon and the verb apóllymi (vv. 1080–1082).

• **Hyginus, Gaius Julius.** (2002). Fabulae. (Edited by PK Marshall). Stuttgart/Leipzig: KG Saur Verlag.
— Note: Indispensable reference for documenting the mythographic variant of the pursuit of Leto by the serpent Python, the aid of the wind Aquilon (Boreas) and the original institution of the Pythian Games (Fables 53 and 140).

• **Vitruvius Pollio, Marcus.** (1990–2009). *Of the architecture*. (Multivolume critical edition, Collection des Universités de France / Budé). Paris: The Beautiful Letters.

◦ **Book I.** (Ed. P. Fleury, 1990). [General theory of architecture, the triad *firmitas-utilitas-venustas* and the context of Augustus' military engineers].

◦ **Book III.** Edited and translated by Pierre Gros (Budé, 1990). Sacred anthropometry, the well-formed human body and the proportional relations of temple design.

◦ **Livre V.** (Ed. C. Saliou, 2009). [Typology of the forensic basilica, metrology of the compact plans and description of the Basilica of Fano and its Aedes Augusti].

• **Vitruvius. (1997). De architectura. (Editing by Pierre Gros, translation and commentary by Antonio Corso and Elisa Romano). Two volumes. Turin: Giulio Einaudi Editore. — Note: Contemporary historiographic edition of absolute reference for the analysis of the transition from the elongated to the compact plan in Fano and its parallelism with the Basilica of Cosa.**

2. Treatises and Commentaries of the Modern Age (Renaissance and Enlightenment)

• Barbaro, Daniele. (1556). The Ten Books on Architecture by M. Vitruvius, translated and commented on by Monsignor Barbaro, elected Patriarch of Aquilegia. With illustrations by Andrea Palladio. Venice: Francesco Marcolini. — Note: A landmark edition of Venetian humanism. Key to the restitution of the apse on the major flank and to the integration of perspective and optics in the regularization of the basilican space.

• Galiani, Berardo. (1758). The architecture of M. Vitruvius Pollione with the Italian translation and commentary. Naples: Stamperia Simoniana. — Note: A pioneering prosopographical study that identifies Vitruvius's collaborators (M. Aurelius, P. Numisius, Gnaeus Cornelius) as citizens of Formiae, grounding the geographical hypothesis of the treatise-writer's origin.

• Giocondo, Fra (Giovanni da Verona). (1511). M. Vitruvius per Jocundum solito punishior factus cum figuris et tabula ut jam legi et intelligi possit. Venice: Giovanni Tacuino.

— Note: First illustrated edition of Vitruvius. It documents the recreation of the Basilica of Fano with a 2:1 proportion plan and the displacement of the apse towards the smaller side.

- Ortiz y Sanz, José, trans. Los diez libros de architectura de M. Vitruvio Polión. Madrid: Imprenta Real, 1787. An illustrated Spanish Enlightenment translation with notes, relevant to the reception of Vitruvian proportion and architectural terminology.

3. Archaeology and Contemporary Historiography

- Beltrán Martínez, Antonio. (1991). « Basilica ». In GER Encyclopedia. Madrid: Rialp Editions. — Note: Documentary basis for the evolutionary analysis of public space and civil buildings in the Roman provinces.
- Glez. Moreno-Navarro, José Luis. (1993). The Hidden Legacy of Vitruvius. Madrid: Editorial Alliance. — Note: Methodological monograph on the transmission of the Vitruvian manuscripts and the debates surrounding the practical interpretation of their construction formulas.
- Pellati, Francesco. (1965). « The Vitruvian Basilica of Fano». In Proceedings of the XI Congress of the History of Architecture. Rome: Center for Studies on the History of Architecture, pp. 95-99. — Note: A classic article indispensable for contextualizing the substructural excavations and the problem of the location of the actual plan in present-day Fano.
- Salatin, Federica. (2012). « The Basilica of Fano. Giocondo, Palladio and il Ferrarese». In Annali di Architettura: Rivista del Centro Internazionale di Studi di Architettura Andrea Palladio, (24), pp. 115–132. — Note: Essential to analyze the formal evolution of Fano's graphic reconstruction hypotheses from the 16th century to modern archaeology.
- Wheeler, Mortimer. (1995). Art and Architecture in Rome. Barcelona: Ediciones Destino. — Note: Archaeological reference manual for understanding the spread of basilicas in Augustan Italy (such as Cosa, Fano and Herdonia/Ordona) and their relevance in imperial urban planning.

Allegory of the duplication of the cube

Editorial note. *— This allegory likewise forms part of the editor's interpretive perspective. The Delian problem of doubling the cube appears in Vitruvius (IX, pref. 13–14) as a historical anecdote; the allegorical and symbolic reading proposed here is the editor's own and carries no philological authority.*

"Following the devastating health crisis that ravaged Athens during the Peloponnesian War, and which claimed the life of the statesman Pericles, a delegation of citizens went to the famous Oracle of Apollo on the island of Delos[1] with the purpose of finding a divine remedy to alleviate the plague. The deity's response dictated a condition of strict geometric precision: to appease divine wrath, it was imperative to erect a new altar that exactly doubled the volume of the pre-existing one, which had a perfect cubic configuration. The Hellenic geometers, committing an error of linear proportionality, proceeded to double the length of the edges of the original altar, which quadrupled its surface area and exponentially increased its volume eightfold[2], thus failing to solve the enigma." Although the epidemic eventually subsided through natural cycles, the mathematical challenge survived as a profound allegory about the inadequacy of elementary arithmetic in the face of the complexity of three-dimensional space.

This episode, recorded in the doxographical tradition by authors such as Eratosthenes of Cyrene and Plutarch, transcends mere historical anecdote to become the birth certificate of the "Delian problem."[3] Apollo's demand was not a mere ritual whim, but a subtle theoretical reproach to the Greeks for their neglect of the geometry of solids, prompting mathematicians of the stature of Hippocrates of Chios, Archytas of Tarentum, and Plato to explore the properties of proportional lines and lay the foundations of the sacred geometry of perfect volumes.[95]

95**The Oracle of Delphi**, in the Sanctuary of Delphi, was a place for consulting the gods, in the sacred temple dedicated primarily to the god Apollo. Located in Greece, in the present-day town of Delphi, at the foot of Mount Parnassus, consecrated to the god himself and the Muses, amidst the mountains of Phocis, at 700 meters above sea level. m above sea level and 9.5 km away from the Gulf of Corinth.

notes for the exegetical and mathematical apparatus

1. Delos and Delphi. The mathematical tradition associates the doubling of a cubic altar with the Delian problem. The story of Apollo's killing of Python belongs to the Delphic cycle. Neither the mathematical legend nor a symbolic comparison establishes the physical form of a particular surviving altar.

2. **geometric error:** If the original altar has a side s, its volume is $V_1 = s^3$. By mistakenly doubling the side (2s), the new volume turns out to be: $V_2 = (2s)^3 = 8s^3$ The Athenians multiplied the volume by eight instead of by two. To exactly double the volume ($V_2 = 2V_1$), the new edge should have measured $s \cdot \sqrt[3]{2}$, an irrational number whose geometric construction was impossible using only the traditional straightedge and compass.

3. **The Platonic interpretation of the myth:** According to Plutarch (*De E apud Delphi*), when the Athenians turned to Plato to solve the problem of the oracle, the philosopher of the Academy replied that Apollo did not need a double altar, but used the pretext of the altar to force the Greeks to abandon political and commercial disputes and dedicate themselves to the study of high geometry, the only discipline capable of purifying the intellect and attuning it to the order of the cosmos.

The traditions should be distinguished. The death of Python belongs to the Delphic cycle of Apollo. The problem of doubling the cube is associated with an oracle at Delos, hence the name "Delian problem". A connection between the two may be explored as an interpretation, but should not be presented as a single ancient narrative.

"According to the foundational account of the *Homeric Hymn to Apollo*, a serpentine creature of colossal proportions — associated by the sources with the chthonic powers of Gaia or her daughter Themis — guarded the ancient oracle of Delphi near the Castalian Spring. The sacred text describes it as a beast of unyielding strength, corpulent, enormous wild beast that brought great misfortunes upon men on earth... It was this dragon who welcomed and fed the fierce and tremendous Typhon, nightmare of mortals."[1]

In the exegesis of sacred geometry, this mythical feat runs parallel to the origin of the most celebrated three-dimensional enigma of antiquity: the **duplication of the cube**, or **the Delos problem.**[2] Along with the squaring of the circle and

the trisection of the angle, this challenge forms the triad of classical problems in Greek geometry. While modern mathematics has demonstrated the impossibility of solving them using only the ideal ruler and compass[3], for ancient thought these dilemmas were not mere axiomatic puzzles, but rather true instruments of theoretical transmutation. They represented states of consciousness and the faculty of deciphering, within allegory, an ontological reality that transcended the written word. To solve them, the geometer needed to undergo a metanoia: to "turn the plane" and approach the archetype from a higher dimension.

The first mathematician to formulate an analytical solution to this problem was Hippocrates of Chios (c. 470 – c. 410 BCE). The pre-Socratic geometer discovered that the problem of doubling the cube reduced geometrically to a problem of interpolation: the insertion of two continuous mean proportionals between a given segment and its double.

Mathematical and Philological Formalisation

In classical notation, and according to the theory of proportions set out in Book VIII of Euclid's *Elements*, if an initial segment a and its double $2a$ are given, and two mean proportionals r and s are inserted between them, the following continued proportion is established:

$$a : r = r : s = s : 2a$$

In modern algebraic notation, this may be expressed as

$$a/r = r/s = s/2a.$$

From these equalities it follows that

$$r^2 = as$$

and

$$s^2 = 2ar.$$

Squaring the first equation and substituting the value of s^2 obtained from the second yields

$$r^4 = a^2 s^2,$$

$$r^4 = a^2(2ar),$$

$$r^4 = 2a^3 r.$$

Since $r \neq 0$, division by r gives

$$r^3 = 2a^3.$$

Thus the cube constructed on the first mean proportional r has exactly twice the volume of the cube constructed on the original segment a. The celebrated Delian problem — the duplication of the cube — therefore ceased to be a matter of physical conjecture and became a rigorous problem in the theory of mean proportionals. The search for the dimensions of the new Apollonian altar was transformed into a precise mathematical investigation grounded in geometric proportion.

Philologically, the designation **"Delian altar"** is preferable to **"Apollonian altar."** Although the tradition associates the episode with an altar of Apollo on the island of Delos, classical and modern scholarship alike have generally referred to the challenge as **the Delian Problem** (*Problema Delium*) or **the Duplication of the Cube*. The use of "Delian altar" therefore aligns the terminology with the established historiographical and mathematical tradition.

Critical Notes

1. **The nature of Typhon and Chaos:** By shooting arrows at the dragon, Apollo not only cleanses the sanctuary, but also subjects the chaotic fluids of the earth to the fixity of the oracular axis (*Omphalos).*

2. **The Transition from the Second to the Third Dimension:** The discovery of Hippocrates of Chios is a methodological stroke of genius. He understood that a solid cannot be duplicated using simple proportions of (two-dimensional) surfaces. By requiring two proportional means instead of one (since a single mean, the geometric mean a: r :: r: 2a, serves to duplicate the square, that is, $r^2 = 2a^2$), Hippocrates forces the elevation from the plane to volume, opening the door to rational three-dimensional geometry.

3. Modern mathematical perspective. Wantzel's result of 1837 establishes that a cube cannot be doubled using straightedge and compass alone, because the cube root of two is not constructible by successive quadratic extensions. This modern proof must not be attributed to ancient geometers. The constructions associated with Archytas and Menaechmus belong to the ancient investigation of the problem by other means. Their association here with light and the material plane is the author's symbolic interpretation.

The first is of a **historical - mathematical** nature: **the** solutions of Archytas, Menaechmus, and Eratosthenes **were not approximate, but geometrically exact**. The misconception lies in the fact that they did not use only a ruler and compass (which is impossible, as modern mathematics has demonstrated), but rather developed advanced mechanical curves and conic sections of absolute precision. The second point of clarification is **philological -etymological:** the original name of the region was not *Pyto*, but **Pito** (from the Greek *Pythó,* Πυθώ), derived from the verb *pythein* (to rot), alluding to the body of the serpent defeated by Apollo.

"Building on the theoretical framework established by Hippocrates of Chios, other preeminent geometers of antiquity took up the challenge of geometric duplication. Far from proposing empirical approximations or estimated calculations, scientists of the stature of Archytas of Tarentum, Menaechmus, and Eratosthenes of Cyrene formulated solutions of strict geometric accuracy. To overcome the operational limitations of the plane ruler and compass, these authors needed to expand the horizons of the discipline: Archytas integrated the third dimension through a bold constructive model of the intersection of three-dimensional solids (a cylinder, a cone, and a torus); Menaechmus discovered conic sections (the parabola and the hyperbola) as spatial cutting tools; and Eratosthenes mechanized the process through a kinematic instrument known as *the mesolabe*."

Alongside this scientific development, the nerve center of the Apollonian cult, the Oracle of Delphi, stood majestically on the slopes of Mount Parnassus in Phocis. The sanctuary, dedicated to Apollo, was inextricably linked to a sacred landscape where water acted as an agent of purification and prophecy. Among the various springs that dotted the site, the Castalian Spring stood out, its waters flowing flanked by a dense laurel forest, the plant attribute sacred to the god.

Mythical tradition celebrated this numinous setting as the meeting place of the Muses, where Apollo's lyre orchestrated the song of the inspired deities. In the context of Archaic and Classical Greece, this sacred site was originally called Pytho*, a* theonym that evoked the chthonic decomposition of the defeated monster. Over the centuries, linguistic usage assimilated both traditions, and the original toponym of Pito yielded its preeminence to the definitive designation of Delphi.

Critical Notes

1. **The accuracy of the "mechanical" solutions: In the history of science, it is vital to clarify that the solutions of the Academy and the school of Tarentum were exact. Archytas of Tarentum (c. 428–347 BCE), a friend of Plato, solved the duplication of the cube using a double-curvature curve that foreshadows modern analytic geometry. Menaechmus (c. 380–320 BCE) demonstrated that the two continuous mean proportionals corresponded to the coordinates where two parabolas, or a parabola and a hyperbola, intersect. To call these solutions "approximate" would weaken the thesis on the regularity of Apollonian geometry.**

2. **The etymology of Pytho (*Pythó)*: The** phonetic change to *Pyto* should be corrected by its academic spelling: **Pito**. Philologically, the name connects the physical space with the myth of the serpent's death: Apollo lets the midday sun *rot* (*pythein*) the monster's corpse. From this "putrefaction" springs the purification of the earth. The later transition to the name **Delphi** (*Delphoi*) is etymologically associated with *delphys* (womb or matrix), signifying that the sanctuary went from being the place of the dragon's death to becoming the spiritual matrix and the *Omphalos (navel*) of the Greek world.[96]

Typhon, in Greek mythology, personified earthquakes and volcanic eruptions. Apollo killed him and let the brilliant Hyperion (the Sun) rot him; in ancient Greek: *pytho*. Hence the name Pythius, by which the god was also known.

96**Delphi** (Greek Δελφοί (m. pl.), Ancient Greek Δελφοί pronounced *Delphoí*), originally called **Pytho** (Πυθώ), was a city of ancient Greece, best known for its oracle. Both names are synonymous.

The list takes as its paradigm the methodology of Christiane Sourvinou-Inwood (the reconstruction of sacred spaces through the tension between myth, archaeology and local thought structures) and is organized thematically under the rules of the **APA format (7th edition)**.

1. Primary Sources: Classical Texts and Philological Commentaries

• **Euclid.** (1991–1996). Elements (Translation and notes by ML Puertas Castaños). Three volumes. Madrid: Editorial Gredos.
— Exegesis: Indispensable for the study of Book VIII, where the theory of continuous ratios and the insertion of the two continuous mean proportionals (a: r :: r: s :: s: 2a) are formalized.

• **Homer.** (2003). Homeric Hymns. The Batrachomyomachia (Introduction, translation and notes by A. Bernabé). Madrid: Editorial Gredos.
— Exegesis: Main source for the analysis of the « Hymn to Pythian Apollo » and the narrative of the god's battle against the chthonic dragon near the Castalian Spring.

• **Plutarch.** (1995). Pythian Dialogues: On the E of Delphi / On the Oracles of the Pythia / On the Disappearance of the Oracles (Translation and notes by FF Santamaría). Madrid: Editorial Gredos.
— Exegesis: Fundamental philosophical corpus for understanding the theological, mathematical dimension and the meaning of the geometric archetypes in the sanctuary of Delphi.

• **Thomas, I.** (Ed.). (1939). Selections Illustrating the History of Greek Mathematics: Vol. I (From Thales to Euclid). Loeb Classical Library. Cambridge, MA: Harvard University Press.
— Exegesis: Critical compilation preserving the original fragments of Eutotius and John Philoponus on Eratosthenes' letter to Ptolemy III concerning the duplication of the cube.

2. Mythography, Sacred Space and the Oracle of Delphi

• Amandry, P. La Mantique delphique. Paris: Éditions de Boccard, 1950.
— Exegesis: Classical archaeological monograph analyzing the sacred topography of Delphi, the role of the Castalian Spring, and the evolution of the Temple of Apollo.

• Burkert, W. Archaic and Classical Greek Religion (Translation by H. Rodríguez Somolinos). Madrid: Editorial Abada, 2007. — Exegesis: An essential reference for understanding the transition from the chthonic cults of Gaia to the Apollonian-solar order and the concept of the Omphalos as the center of the world.

• Fontenrose, J. Python: A Study of Delphic Myth and Its Origins. Berkeley: University of California Press, 1959. — Exegesis: The definitive study on the mythical morphology of the combat between Apollo and Python/Typhon, tracing the linguistic origins of Python.

• Sourvinou-Inwood, C. "The Myth of the First Temples at Delphi." The Classical Quarterly, 29(2), 231–251. 1979. https://doi.org/10.1017/S0009838800035874 — Exegesis: Reference article that unravels the architectural and mythical transition from the primitive temples of laurel and beeswax to the stone structures.

3. History of Greek Geometry and the Delic Problem

• Cuomo, S. Ancient Mathematics. London/New York: Routledge, 2001. — Exegesis: Excellent sociocultural analysis of the role of mathematicians in the classical world and the epistemological status of problem-solving.

• Heath, TL A History of Greek Mathematics: Vol. 1. From Thales to Euclid. New York: Dover Publications. (Original work published in 1921), 1981. — Exegesis: The most comprehensive technical reference work on the exact solutions of Hippocrates of Chios, Archytas of Tarentum, and Menaechmus by means of mechanical curves.

• Knorr, WR The Ancient Tradition of Geometric Problems. Boston: Birkhäuser, 1986. — Exegesis: A fundamental critical study on the evolution of cube duplication, circle squaring, and angle trisection within Greek philosophical thought.

• Netz, R. The Shaping of Deduction in Greek Mathematics: A Study in Cognitive History. Cambridge: Cambridge University Press, 1999. — Exegesis: Analyses how the use of diagrams and the rotation of geometric planes altered the states of consciousness and analytical reasoning of Plato's Academy.

4. Philosophy of Space and Archetypal Geometry

• Cornford, FM Plato's Cosmology: The Timaeus of Plato. London: Kegan Paul, 1937. — Exegesis: Key to linking the cube (as the Platonic solid of Earth and stability) with the demands of the Oracle of Delos on the geometric regularization of matter.

• Kingsley, P. Ancient Philosophy, Mystery, and Magic: Empedocles and Pythagorean Tradition. Oxford: Clarendon Press, 1995. — Exegesis: Explores the esoteric currents of the pre-Socratic geometers, demonstrating that for figures such as Archytas of Tarentum, geometry and music were vehicles of spiritual transmutation.

• Lawlor, R. Sacred Geometry: Philosophy and Practice. London: Thames & Hudson, 1982. — Exegesis: Contemporary methodological reference manual for the interpretation of proportional means as archetypes of mediation between the profane and the divine plane.

• Vernant, J.-P. (1985). Myth and thought in ancient Greece (Translation by JD López Bonillo). Barcelona: Editorial Ariel. — Exegesis: Fundamental to understanding the concept of geometric space in Greece as a reflection of the democratization and rationalization of cosmic and political structures.

Philologically, the serpent's name is **Python** (in Greek, *Pythōn*, Πύθων) and the region or primitive sanctuary was called *Pytho* **(**Pythō*,* Πυθώ). According to the classical mythical etymology found in the Homeric Hymn to Apollo, the names of the monster and the place derive *from* the verb *pythein (πύθειν, "*to rot"), since the god allowed the sun to corrupt the creature's corpse. Furthermore, in classical architecture, the plinth is not located at the base of the capital, but at the base **of the column** (the element crowning the capital is the *abacus)*;

nevertheless, the geometric intuition is accurate: the plinth represents the square base or cube upon which the order rests.

"From this toponym derives the title of *Pythia* (*pythōnissa), the* official designation of the priestess who channeled prophecies in the sacred precinct of Delphi. The term Pythō (*Pythō*) *is* inextricably linked to *Python*, the mythical serpentine creature that guarded the buttresses of Mount Parnassus and which Apollo slew to establish his oracular hegemony. According to mythographic tradition, after defeating the monster, the god deposited its ashes in an underground receptacle located immediately beneath the *omphalos; it was from this 'navel of the* world' that the priestesses assimilated the prophetic vapors emanating from the chthonic entrails to deliver their oracular responses." In the sacred topography of Hellas, the temple consecrated to this deity was called *Pythion* (in classical Greek, Πύθιον), and the god himself received the cultic epithet of Apollo Pythius.

During the Archaic period, the veneration of Apollo took on a markedly geometric character, being worshipped in the form of a **plinth** (πλινθός), a term that in classical sources designates both the mud brick and the cubic pedestal. This aniconic form of worship — the sacralization of a pure geometric volume in place of anthropomorphic or figurative representation — is solidly documented in ancient literature and the archaeology of Latium and Greece. In the grammar of the classical architectural orders, the plinth constitutes the smooth, quadrangular element that serves as the base and interface between the column shaft and the stereobate, symbolizing the cubic fixity upon which the verticality of the Doric and Tuscan orders unfolds.

Critical Notes

1. **Architectural Clarification (Plinth vs. Abacus): It is vital for** technical rigor not to confuse the plinth with the abacus. The plinth is at the base of the **column** (earth, cubic stability). The abacus is at the top, crowning the capital. The plinth, as a "cubic pedestal," acquires perfect coherence with the concept of the cubic altar of Delos: the god of geometry manifests himself at the very base of the structure, in the cubic rooting with matter.

2. **The Aniconic Cult and the Cube:** The mention of the plinth as a primitive form of Apollo. Authors such as Pausanias document that in Megara and Amyclae, Apollo was worshipped as a bronze column or a quadrangular

pillar. This demonstrates that before Greek art humanized the gods (anthropomorphism), the divinity of light and order was expressed through mathematical abstraction. The god *is* the cube, the straight line, and pure proportion.

3. **The *Omphalos* as a transmuter:** The presence of the serpent's ashes under the *Omphalos* (which was physically a semi-spherical, oconic stone) represents the geometric containment ***of*** the forces of chaos. Apollo *does* not destroy the energy of the earth (the serpent), but rather buries it under an ordered geometric axis (the navel of the world) to transform it into prophecy and rational word (*logos*).

Vitruvius's journey

The biographical details of Marcus Vitruvius Pollio remain shrouded in a dense historiographical obscurity; virtually all information about his life comes from passages in his own treatise, *De architectura*. The determination of his *three names* is the subject of long-standing philological debates. While the late manuscript tradition consolidated the *cognomen* "Pollio, " the epigraphic record has opened alternative avenues of research: an inscription found in Verona documents a *Lucius Vitruvius Cordo*, while another epigraphic evidence in *Thibilis* (Numidia, North Africa) records the name *Marcus Vitruvius Mamurra*. This latter coincidence has fueled the intriguing hypothesis of a family relationship, or even a shared identity, between the treatise writer and Mamurra, the celebrated and influential chief engineer (*praefectus fabrum*) of Julius Caesar. However, none of these attributions finds explicit endorsement in the text of *De architectura*, a work that the author formally dedicated to Octavian Augustus.

On an institutional and professional level, Vitruvius served as a military engineer within the legionary establishment, performing functions similar to those of a *praefectus fabrum* or an *architectus* assigned to the *armamentarium* (the state artillery arsenal). His technical relevance was confirmed in later literature: Pliny the Elder includes him by name in the *index auctorum* of his *Naturalis Historia* as an authority on the science of materials and mosaic paving techniques, while Sextus Julius Frontinus, at the end of the 1st century AD, explicitly refers to "Vitruvius the architect" in his treatise *De aquaeductu* when addressing the standardization of lead pipe modules (*fistulae*).

According to the autobiographical statements in his prefaces, Vitruvius was born into a family of free Roman citizens and pursued his career in the campaigns of the late Republican civil wars. He served in Julius Caesar's artillery forces alongside a select corps of technical officers including Marcus Aurelius, Publius Numisius, and Gnaeus Cornelius. During these campaigns, his geographical postings encompassed various fronts of the *Roman Empire*: North Africa, Hispania, Pontus, and Gallia Comata (including the regions of Aquitania and Gallia Narbonensis).

The nature of the military *Apparatio* in the Roman army

To accurately gauge the operational scope of Vitruvius's rank as a military engineer, historiography frequently turns to the later testimony of Flavius Vegetius Renatus in his *Epitoma rei militaris*. Vegetius details the vast responsibilities of the *praefectus castrorum* (camp prefect), a high-ranking officer in charge of the army's construction and logistics: the fortification of the perimeter, the digging of trenches, the organization of tent accommodations, as well as the maintenance and provisioning of siege machinery and transport vehicles.

Within this technical framework, Vitruvius specialized in the apparatio tormentorum, that is, the construction and calibration of torsion artillery pieces, primarily ballistae and scorpions, crucial ballistic weapons for siege warfare. Various indications suggest that this training took place under the direct orders of Lucius Cornelius Balbus, the influential praefectus fabrum of Julius Caesar's Gallic campaigns. The precise passages in Vitruvius's treatise analyzing siege mechanics reflect firsthand experience in the major theaters of operations of 52 BCE, such as the fierce siege of Avaricum, the tactical operations before the walls of Gergovia, and finally, the monumental work of circumventing and besieging the stronghold of Alesia.

Critical Notes

1. Clarifying the Mamurra Case: The connection between Vitruvius and Mamurra is fascinating. Mamurra was Caesar 's *praefectus fabrum* in Gaul, famous for his immense wealth and for having introduced the first Carrara marble (*marmor lunense*) paneling into his palace on the Caelian Hill. If Vitruvius was not Mamurra himself, he undoubtedly belonged to the same technical *management. This gives Vitruvius a* status far higher than that of a

simple soldier: he was a man embedded in the elite of engineering in the Republic.

2. **The technical precision of the weapons:** Ballistae and scorpions were not calibrated empirically or randomly. In Book X, Vitruvius details how Roman engineers used a mathematical formula based on the weight of the projectile to calculate the diameter of the bore in the bundles of torsion tendons. Roman artillery, therefore, was pure geometry applied to military ballistics.

3. **The parallel with Vegetius:** Although Vegetius wrote several centuries later (at the end of the Empire), his description of the legions' technical environment confirms that Roman architects were not trained in academies of fine arts, but in the mud of the trenches, surveying the terrain, building palisades, and ensuring the water supply. This is the origin of Vitruvian *firmitas*: the solidity that must withstand both the ravages of time and the enemy's catapults.[97]

"Despite his extensive career in military engineering, Vitruvius's enduring legacy lies in his role as a theorist and systematizer of architecture. In the context of ancient Rome, *architectura* was a discipline of a vastly broader scope than its contemporary counterpart; it encompassed urban planning, construction management and physics, civil and materials engineering, metallurgy, hydrodynamic mechanics, military ballistics, and the science of mechanical devices. This cross-disciplinary nature has led the historiography of technology to recognize Vitruvius as the seminal pioneer of architectural engineering and technical building."

In the field of urban planning and the establishment of settlements, Vitruvius pioneered the integration of Hippocratic medical precepts through **miasmatic theory**. He maintained that the emanations exhaled by marshy and swampy lands acted as vectors of infectious diseases. When addressing the selection of a site (*de electione locorum sanissimorum) for the founding of cities or fortresses, the treatise writer* stipulated the obligation to select elevated locations, free from dense fogs and sheltered from extreme climatic fluctuations. He warned with

97Ballista, related to Greek βάλλειν ('to throw'), denotes an ancient two-armed torsion engine. Vitruvius distinguishes its calibration from that of the catapulta or scorpio: in 10.10 the initial datum is the length of the projectile, whereas in 10.11 the ballista is calibrated from the weight of the stone. The two systems must not be merged into a single modular rule.

methodological emphasis about the harmfulness of morning breezes, capable of carrying into the urban fabric the condensed fogs of wetlands laden with deleterious organic effluvia from marsh fauna. He also determined that coastal foundations facing south or west suffered from chronic unhealthiness, because continuous sun exposure and thermal stagnation altered the balance of the inhabitants' body humours.

Technical Standardization: Hydraulics and Theatrical Acoustics

Vitruvius's expertise in the development of public infrastructure was confirmed by Sextus Julius Frontinus, who acknowledged his contribution to the metrological standardization of the diameter of lead pipes (*fistulae*), a critical advance for the distribution of imperial water resources. Similarly, the historiography of science hails him as the founder of architectural acoustics thanks to his meticulous description of bronze resonating vessels or *echeia* (ἠχεῖα). These devices, arranged in symmetrical niches beneath the seating tiers of theaters according to strict laws of Pythagorean musical harmony, served to amplify the actors' voices through physical resonance.

Although the catalog of his material works remains undocumented, the author left evidence of his direct involvement in the construction of the Basilica of Fanum Fortunae (modern-day Fano), whose erection dates to the first decades of Augustus's reign (c. 27–15 BCE). The material remains of this structure have disappeared from the surface, opening a complex archaeological debate about its exact topographical location. One of the most plausible historiographical hypotheses suggests that, given the recurring early Christian practice of Christianizing civil forum spaces, the substructures and colonnade of the Vitruvian basilica may have been absorbed and integrated into the medieval fabric of the current Romanesque cathedral of Fano.

Critical Notes

1. Miasmatic Theory as the Ordering of Chaos: The section on miasmas is vital. Vitruvius demonstrates that the architect not only arranges the stones, but also regulates the **invisible elements** (air, water, heat). The corrupt air of the swamps represents the chaos of untouched nature; architecture, by choosing the elevated site and laying out the walls, acts as a filter that purifies the environment and allows the Apollonian *light* and clean air to sustain the life of the *citizen*.

2. **The resonating vessels (*Echeia*) and acoustic harmony: The echeia** described *in* Book V (V, 5) are definitive proof that Vitruvian architecture is solid music. Vitruvius explains that the vessels must be tuned at intervals of a fourth, fifth, and octave. This connects directly with the proportional means of doubling the cube: the Roman theater is not just a building for leisure, but a mathematical instrument designed to attune the vibrations of the human voice to the mathematical harmonies of the cosmos.

3. **The syncretism of the Basilica of Fano:** The hypothesis that Vitruvius' basilica underlies the cathedral of Fano closes the evolutionary cycle of the building: the civil structure built by Augustus' architect to house the *Aedes Augusti* (the cult of the emperor) ended up becoming the formal matrix of the Christian temple, demonstrating the perenniality of its geometric axes.

In his later years, Emperor Augustus sponsored Vitruvius through his sister Octavia Minor, possibly granting him a pension to ensure his financial independence.

The authorship of "De architectura" remains a subject of debate, as it is uncertain whether the text was written by a single author or is a compilation made by later librarians and copyists. The date of Vitruvius's death is unknown, suggesting that he may not have been very popular during his lifetime.

Vitruvius's influence and recognition endure to this day. Gerolamo Cardano[98], in his 1552 book "De subtilitate rerum," lists him as one of the twelve individuals who, in his view, surpass all others in genius and invention. He might even have placed him first had it been clear that Vitruvius had written down his own discoveries. Furthermore, in James Anderson's "The Constitutions of the Masons" (1734), reprinted by Benjamin Franklin, Vitruvius is considered "the father of all true architects to this day. "

In the preface to Book VII, Vitruvius articulates a profound defense of his own intellectual and methodological rigor through one of the first historiographical reviews of ancient scientific literature. The treatise writer introduces a severe ethical and political reflection on the asymmetry of historical

98 Gerolamo **Cardano**, also Geronimo or Girolamo Cardano (from Milan) and Cardano Hieronymus Cardanus (Mediolanensis), Latinized as Hieronymus Cardanus (Mediolanensis) (born September 24, 1501 in Pavia; died September 21, 1576 in Rome), was an Italian physician, philosopher, and mathematician and is one of the humanists of the Renaissance.

recognition: he denounces how, frequently, the genius and merits of extraordinary professionals remain in obscurity due to their lack of political connections, while upstarts or figures of little talent are elevated thanks to the favor of the elites and fortune. By projecting this fear onto his own future, Vitruvius conceives of his treatise not only as a technical manual, but as a documentary monument intended to preserve the universal memory of architecture *against* the contingency of oblivion.

To illustrate the universality and genealogy of knowledge, the author compiles a comprehensive inventory of scientific, philosophical, and artistic authorities. This list, structured in an encyclopedic manner, is broken down into the following critical categories:

I. Wise Men of Nature and Thought

- **Physicists (Physici): Thales of Miletus, Democritus of Abdera, Anaxagoras of Clazomenae and Xenophanes of Colophon.**
- **Philosophers (*Philosophi*):** Socrates, Plato, Aristotle, Zeno of Citium and Epicurus.
- **Monarchs and Patrons (*Reges*):** Croesus of Lydia, Alexander the Great and Darius of Persia.

II. Treatises on Representation, Plagiarism and Optics

- **On plagiarism and the rights of invention (On plagiarism): Aristophanes of Byzantium (the Alexandrian philologist, active c. 200 BCE), the Ptolemaic king who instituted the Alexandrian contests, and the monarch Attalus I of Pergamon.**
- **On the vituperation of classical authors (*De obtrectatoribus*):** Zoilus of Amphipolis (nicknamed *Homeromastix* or "the scourge of Homer") and Ptolemy II Philadelphus.
- **On perspective and stage design (*De scaenographia* and optical divergence):** Agatharchus of Samos, Aeschylus (in the context of stage design for his tragedies), Democritus and Anaxagoras (who theorized about the projection of lines from an optical center).

III. Treatises on Sacred Architecture (*De aedibus sacris*)

- **Silenus:** Writer on the proportions of the Doric order.
- **Theodore of Samos:** Co-author of the treatise on the Heraion of Samos.

- **Chersiphron (*Chersiphron*) and Metagenes:** Architects of the Artemision of Ephesus.
- **Ictinus and Carpio:** Theorists of the Parthenon ***of*** Athens.
- **Theodore the Phocaean:** Author of the treatise on the Tholos of Delphi.
- **Hermogenes of Alabanda: The great systematizer of the Ionic order and** pseudodipteral symmetry.
- **Arcesius:** Writer on Ionic proportions.
- **Satyr and Pytheos*:* Designers** and theorists of the Mausoleum of Halicarnassus.

IV. Visual Artists and Theorists of Symmetry (*De symmetriis*)

- **Sculptors and Plastics (*Artifices*):** Leochares, Bryaxis, Scopas, Praxiteles and Timotheus (the illustrious masters in charge of the sculptural decoration of the Mausoleum).
- **Writers on the laws of body and modular symmetry:** Nexaris, Theocides, Demophilus, Polis, Leonidas, Silanion, Melampus, Sarnacus and Euphranor of Corinth.

V. Engineers of Mechanics and Poliorcetics (De *machinis*)

- **Diades of Pela:** Alexander the Great's siege engineer.
- **Archytas of Tarentum:** Theorist of elementary mechanics.
- **Archimedes of Syracuse:** Founder of hydrostatics and statics.
- **Ctesibius of Alexandria:** Pioneer of pneumatics and hydraulics.
- Nymphodorus, Philo of Byzantium, Diphilus, Democles, Carias, Polyidus of Thessaly, Pyrrhus and Agesistratus: Authors of treatises on ballistics, polemology and fluid mechanics.

VI. The Roman Tradition and the Universal Masters

- **Roman writers on architecture:** Fuficio (the first Roman to theorize about the discipline), Marcus Terentius Varro (in his *Disciplinae*) and Publius Septimius.
- **Architects of the republican and imperial administration:** Antistates, Calescro (*Callaeschrus*), Antimachides and Pormo (architects who started the Olympian Temple of Athens under Pisistratus), along with

Cossutius, the Roman citizen who continued this construction in the Hellenistic period.

- **The greatest masters of temple architecture (*Summi architecti*):** Chersiphron of Knossos, Metagenes, Demetrius, Paeonius of Miletus, Daphnis of Ephesus, Ictinus, Philo of Athens (architect of the Piraeus arsenal), Cosucius and Gaius Mucius (architect of the Temple of *Honos et Virtus* in Rome).

Through this extensive bibliographic apparatus, Vitruvius places his work at the final link in a sacred chain of human knowledge. By indexing these authorities, he demonstrates that *architecture* is not merely an empirical or manual craft, but a unified science that absorbs physics, geometry, aesthetics, and mechanics, demanding for its practice a profound moral rectitude in the face of the forgetfulness of time.

Critical Notes

1. **The value of the Preface to Book VII:** This text is the first Western "history of architecture." Vitruvius constructs his intellectual family tree here. It is significant that he relates the physics of Thales to the machinery of Archimedes, and the symmetry of Hermogenes demonstrates that all ancient knowledge forms a unified matrix.

2. The Interpolation of Optics (Agatarchus, Democritus, Anaxagoras): The mention of these authors in the section "On Divergence" is crucial. Vitruvius explains that Agatharchus painted a stage set for Aeschylus and left a treatise on how straight lines must curve or diverge to suit the human eye. This demonstrates that Roman sacred geometry was not rigid; architects knew that for a building to appear perfectly cubic or symmetrical to the human eye, they had to apply invisible optical corrections to the actual lines.

3. **The legitimization of Cossutius and Mucius:** By including Roman architects (*Cossutius*, *Mucius*) on the same level as the Greek geniuses Ictinus or Chersiphron, Vitruvius is performing an act of cultural nationalism: he demonstrates that Augustan Rome has reached the technical and artistic maturity necessary to inherit and perfect the geometric canon of the Hellenistic world. Roman space is now the definitive container of *Sophia*.

1. Critical Monographs on the Identity and Context of Vitruvius

- Baldwin, B. «The Date, Identity, and Career of Vitruvius». Latomus, 49(2), 425–434. 1990. — Exegesis: Seminal article for the prosopographical

discussion on the social status of Vitruvius, his active chronology and the viability of the hypotheses that link him with the inscriptions of Verona and Thibilis.

• McEwen, IK. Vitruvius: Writing the Body of Architecture. Cambridge, MA: MIT Press, 2003. — Exegesis: A masterpiece of contemporary historiography. It analyses how Vitruvius' treatise seeks to "write" the body of architecture as a reflection of the body of the Empire and of the sovereign Augustus himself, linking anthropometry with political power.

• Nicolet, C. L'Inventaire du monde: Géographie et politique aux origines de l'Empire romain. Paris: Éditions Fayard, 1988. — Exegesis: Historical contextualization indispensable to understand how Vitruvius' inventory of authors and places participates in the same effort of global ordering and territorial control characteristic of the principate of Augustus.

2. Military Engineering, Poliorcetics and *Apparatio* in the Era of Caesar and Augustus

• Callebat, Louis, and Philippe Fleury, eds. Dictionnaire des termes techniques du De architectura de Vitruve. Hildesheim: Olms-Weidmann, 1995. — A reference work for the technical language of the treatise.

• Harmand, J. L'armée et le soldat à Rome de Marius à Auguste. Paris: Éditions de Boccard, 1967. — Exegesis: Reference monograph on the internal structure of the late republican legions, essential for defining the powers of the praefectus fabrum and of the technicians who operated in sieges such as those of Avaricum and Alesia.

• Marsden, EW Greek and Roman Artillery: Historical Development. Oxford: Oxford University Press, 1969. — Exegesis: Technical and historical analysis of the evolution of ballistae and torsion scorpions, validating the mathematical formulas set forth by Vitruvius in Book X.

• Vegetius Renatus, Flavius. (2006). Compendium of Military Technique (Trans. by D. Paniagua Aguilar). Madrid: Editorial Cátedra. — Exegesis: Comparative classical source (Epitoma rei militaris) used to contrast the logistical and construction functions of the camp prefect with the engineering practices in Vitruvius's time.

3. Urban Hygiene, Theatrical Acoustics and Reception of Treatises

• Brodersen, K., and Brodersen, C. (Eds.). (2015). Cetius Faventinus. Das römische Eigenheim / De architectura privata. (Latin /German bilingual edition). Wiesbaden: Marix Verlag. — Exegesis: Critical compilation of the 3rd century AD compendium made by M. Cetius Faventinus, capital testimony that demonstrates how Vitruvius ' work was abbreviated and adapted for private and domestic architecture in Late Antiquity.

• Frontinus, Sextus Julius. (1998). The Aqueducts of the City of Rome (Translation and notes by M. Consuelo Álvarez and R. Iglesias). Madrid: Spanish National Research Council (CSIC). — Exegesis: Control text that sanctions the official status of Vitruvius in the history of Roman hydraulics and the standardization of fistulae.

• Landels, JG Engineering in the Ancient World. Berkeley: University of California Press, 2000. — Exegesis: A reference manual for contextualizing Roman physics and engineering, with specific sections devoted to the theory of resonating vessels (echeia) in theatres and fluid management.

• Scarborough, J. Roman Medicine. London: Thames & Hudson, 1969. — Exegesis: Study of medicine in the Roman world, essential for the correct exegesis of the miasmatic theory and environmental teratology applied by Vitruvius in Book I during the selection of urban plots.

Methodological validation note

The addition of **Cetius Faventinus's work** (Brodersen edition) exceptionally strengthens the section on Vitruvius's enduring significance. It demonstrates that his treatise did not disappear after the first century, but rather that the later imperial administration itself needed to systematize extracts from the text (*De*

architectura privata) to maintain the state's construction standards, thus linking the author's biography with his lasting technical impact.

To consolidate this crucial chapter on the historiographical fortune of the Vitruvian treatise, it is necessary to specify the technical transition between the Roman world and its humanist rediscovery.

From the perspective of the archaeology of construction, the relative silence of Antiquity was not solely due to obscure language, but also to a technological shift: Vitruvius wrote at the dawn of the Principate (still within an architectural tradition rooted in Hellenistic stonework and lintels), just before the great revolution of *opus caementicium* (Roman concrete) and the monumental vaulted structures that characterized the 1st and 2nd centuries AD (amphitheaters, large baths, and aqueducts supported by arcades). Furthermore, the discovery at Poggio Bracciolini in 1416 was not the only manuscript found, but rather the catalyst for the humanist philology that led to Sulpicius da Veroli's *editio princeps* and Alberti's creative reinterpretation.

" The reception of *De architectura* in the literature of classical antiquity presents a historiographical paradox: despite being the only theoretical corpus of the discipline preserved in its entirety, its immediate impact on imperial texts was remarkably restricted, limited to the technical mentions of Pliny the Elder, Sextus Julius Frontinus, and the late antique epitome of Cetius Faventinus. This hermeneutical asymmetry is due to stylistic and technical-structural reasons. On the one hand, Vitruvius's prose — characterized by archaic Latin and neological terminology of Hellenistic origin — was difficult to assimilate outside the guilds of the state *apparatus*. " On the other hand, the treatise was written during the transition from the Republic to the first Empire, a tectonic horizon still anchored in the trabeated orders of Greek origin; because of this, Vitruvius did not systematize the imminent Roman building revolution that would define the following centuries, characterized by the monumental exploitation of *opus caementicium*, the large tiers of amphitheaters, the development of the engineering of pillars and arches, and the physics of concrete vaults.

Despite this retreat in the visual culture of the High Empire, the treatise survived the fragmentation of the West through a robust network of manuscript transmission during the Early and Late Middle Ages. Contemporary philology documents the survival of approximately eighty codices of medieval tradition,

among which stand out copies from the Anglo-Saxon and Carolingian eras produced around 800 CE. The preservation of these testimonies in the scriptoria of abbeys and basilica monasteries — such as St. Gallen, Cluny, Canterbury, and Oxford — demonstrates that the Vitruvian text functioned as a repository of Latinity and encyclopedic knowledge, preserving the conceptual framework that would link classical theory with the Renaissance.

The advent of Quattrocento humanism radically transformed this scholarly status, elevating Vitruvius to the position of canonical authority for the refounding of constructive practice. The *ad fontes movement* spurred intellectuals like Poggio Bracciolini to undertake philological research campaigns in monastic libraries; in 1416, Bracciolini unearthed a critical copy of *De architectura* in the Monastery of St. Gallen, an event that catalyzed the constructive exegesis of the Quattrocento. This process of literary restitution reached its apotheosis with the publication of the *editio princeps* of the treatise, printed in Rome around 1486 by the humanist Giovanni Sulpicio da Veroli (Sulpicius of Aquila), an event that inaugurated the era of architectural printing and the standardization of European theoretical debate.

Hermeneutics and the Genesis of the Modern Treatise

Given that medieval manuscripts lacked Vitruvius's original graphic apparatus (the *figures* mentioned in the text had been lost in the copying process), Renaissance architects were compelled to adopt a methodologically dual approach. The practical application of the ten books demanded a constant dialectical confrontation between the abstract text and the direct *examination of the surviving archaeological ruins on Italian soil. Far from being an obstacle, the frequent discrepancies between* Vitruvian prescriptions and the materiality of imperial monuments — such as the Colosseum or the Pantheon — opened up a fertile space for interpretive freedom. This hermeneutical gap allowed modern masters to deploy a high degree of creativity and geometric rigor in their spatial design.

The Vitruvian influence shaped the foundations of Western architectural theory well into the 19th century. As early as 1452, Leon Battista Alberti completed his *De re aedificatoria*, a seminal work that adopted the decemviral structure and tripartite conceptual framework of his Roman predecessor, albeit reconfigured through the lens of Platonic philosophy. The expansion of the

canon was accelerated by an ambitious program of European vernacular translations, marked by milestones such as the first critical edition in German, published in 1548 by the scholar Walther Hermann Ryff, which consolidated the transalpine universalization of the architectural *Sophia* of Antiquity.

Critical Notes

1. **The Fracture of *Opus Caementicium*:** Regarding sacred space and the cube, this point is crucial. Vitruvius defends the use of dressed stone and the traditional Greek static structure because he sees in it an immutable mathematical order. However, later emperors (from Nero with the *Domus Aurea* to Hadrian with the Pantheon) preferred concrete, a malleable material that allowed them to curve space and create colossal domes. By not addressing these developments, Vitruvius preserved the purity of the straight line and the elemental cubic volume, which is precisely what Alberti and the Renaissance architects inherited to purify sacred space in contrast to the Gothic style.

2. **The paradox of the missing *figures:*** It is crucial to emphasize the significance of the absence of illustrations in the text discovered by Poggio Bracciolini. Without drawings, the Renaissance had to *imagine* proportions through the pure abstract geometry described in the words. Architects like Bramante, Raphael, and Palladio had to rediscover the modular law by reconstructing plans using only ruler and compass, which transformed architecture into a superior mental and mathematical science, detached from the mere medieval craftsmanship of stonemasons.

3. **The transition from Vitruvius to Alberti:** Leon Battista Alberti did not simply copy Vitruvius; he effected a subtle theoretical transmutation. While the Roman presented an eminently practical vision linked to state engineers, Alberti elevated *venustas* to the category of **Concinnitas** (the universal harmony of all parts regulated by absolute mathematical laws, where nothing can be altered without destroying the whole). This is the direct bridge to the hypothesis put forward here: Renaissance architecture takes Vitruvius's military and pragmatic heritage and transforms it into a three-dimensional spatial theology.[99]

99De re aedificatoria ('On the Art of Building') is Leon Battista Alberti's Latin architectural treatise in ten books, composed around the middle of the fifteenth century. Its critical engagement with Vitruvius made it a foundational text of Renaissance architectural theory.

"A key pillar of Vitruvian sacred anthropometry is the theoretical formulation of homo *bene figuratus* (De *architectura*, III, 1, 1), a concept that prescribes the intrinsic geometric correspondences of the human body and its precise inscription within the perfect forms of the circle and the square. This microcosmic analogy acted as a powerful catalyst for Renaissance artists and humanists, finding its most celebrated iconic embodiment in Leonardo da Vinci 's *Vitruvian Man* (c. 1490). Centuries later, on the horizon of 20th-century modernity, the Swiss-French architect Le Corbusier revived Vitruvian modular methodology through the development of the *Modulor* (1948)." This system of spatial regulation constituted a harmonic scale that combined the proportions of human physiognomy with the golden section and the mathematical series of Fibonacci, with the purpose of standardizing architectural and industrial production to the measure of man.

Regarding the material transmission of the text, contemporary historiography has debunked the myth of the sudden "rediscovery" of Vitruvius by Poggio Bracciolini in 1416 at the Abbey of St. Gall (and not, as a later tradition now discarded claimed, at Montecassino in 1414). Philological research clarifies that Bracciolini unearthed a critical codex of De *architectura in the library of the Monastery of St. Gallen in 1416; however, this event* did not represent a complete break with the medieval past, but rather the culmination of a latent process of assimilation. Preeminent humanists of the Trecento, such as Francesco Petrarch and Giovanni Boccaccio, had already frequented and annotated Vitruvian manuscripts during the 14th century, demonstrating that the knowledge of Augustus's architect never completely died out in the cultural substratum of pre-Quattrocento Italian intellectuals.

Critical Notes

1. **Bibliographical correction: The exact translation of Marc van** den Broek's work (2018) should appear in the apparatus as: *Leonardo da Vinci: The Inventions. A Search for Traces*.

2. Vitruvius describes a well-formed human body inscribed in a circle and a square (3.1.3). With the person lying on the back and the limbs extended, compasses placed at the navel trace a circle touching the fingers and toes. The

equality of bodily height and arm span supplies the square. Leonardo gives the two constructions distinct centers: the circle at the navel, the square near the groin. The reading of this distinction as a dynamic relation between regulating centers is the author's interpretive proposal. It does not establish that Leonardo corrected a lost classical drawing.

3. **The Petrarch-Boccaccio continuity:** Emphasizing that Petrarch read Vitruvius in the 14th century reinforces the theoretical framework regarding the enduring nature of Sophia. Vitruvius was not a "forgotten and resurrected" author, but rather a subterranean presence that silently guided Western aesthetic thought throughout the Middle Ages until it exploded in the Renaissance.

Petrarch owned and studied Latin manuscripts of Vitruvius (such as the famous Codex Metropolitanus *or* its copies in Avignon), making marginal notes (*scholia*) and commenting on passages in his letters, but the vernacular (Italian) was not used for the translation of this technical treatise until well into the 16th century.

"Francesco Petrarch's intervention in the Vitruvian tradition did not result in a linguistic transposition into Italian, but rather in a work of rescue, collation, and philological exegesis in Latin during the 14th century. Petrarch, considered the herald of Renaissance humanism, located and preserved in his private library manuscript copies of *De architectura* — at a time when the treatise was considered an extremely opaque text — marking its margins with valuable critical annotations (*scholia*) that clarified the careless syntax of Imperial technical Latin. His approach to the architect of Augustus was literary and archaeological in nature, motivated by his desire to reconstruct the topography and monumental glories of classical Rome, thus establishing the method that the humanists of the *Quattrocento would inherit*."

The history of vernacular reception includes manuscript translations as well as print. Cesariano's Como edition of 1521 was the first printed Italian translation, distinguished by its extensive commentary and woodcuts. Daniele Barbaro's Venetian edition of 1556, with contributions by Palladio, belongs to a later stage of that reception. Petrarch's engagement with Vitruvius was Latin and scholarly; it should not be confused with these printed vernacular translations.

Critical notes and philological apparatus

1. **The myth of Petrarch's translation:** It is a common mistake to confuse Petrarch's love for the vernacular (expressed in his *Canzoniere*) with his scholarly work. For Petrarch, the works of Roman science, philosophy, and architecture had to be treated in the language of the Empire: Latin. His work with Vitruvius consisted of cleaning the text of the errors that medieval copyists had introduced over centuries.

2. Cesare Cesariano (1521). His first printed Italian translation is a milestone in the visual and vernacular reception of Vitruvius. Its commentary and illustrations make technical questions accessible through the architectural culture of the Italian Renaissance, rather than simply reproducing a lost ancient illustrative program.

3. In the author's interpretation, the passage from learned Latin reception to vernacular architectural writing marks a widening of the treatise's readership. That symbolic reading should be distinguished from evidence for the actual circulation, ownership, and use of particular manuscripts and printed editions.

1. Critical Catalog of the Principal Codices (*Codices Maiores*)

The principal witnesses are cataloged in Table 9, with the shelfmarks and dates used by the relevant editions and library catalogs. Krohn's preface distinguishes H and S from the Gudianus witnesses E and G. Rose's additional sigla are identified separately; a shared label does not establish that two manuscripts are the same witness.

2. Critical Bibliography and Textual Historiography

This section gathers monographs, reference critical editions and specialist articles relevant to the exegetical apparatus. Bibliographical references follow the Chicago Manual of Style, 18th edition.

- Callebat, Louis, and Philippe Fleury, eds. *Dictionnaire des termes techniques du De architectura de Vitruve*. Hildesheim: Olms-Weidmann, 1995. — A reference work for the technical vocabulary of the treatise; see the full bibliography.
- Cesariano, Cesare, trans. and comm. *Di Lucio Vitruvio Pollione de architectura libri dece, traducti de latino in vulgare, affigurati, commentati*.

Como: Gottardo da Ponte, 1521. — The first printed Italian translation, with extensive commentary and woodcuts.

- Gros, P. Vitruve et la tradition des traités d'architecture: Fabrica et Ratiocinatio. Rome: École Française de Rome, 2006. — Exegesis: A masterpiece by the main contemporary editor of Vitruvius. It analyses the stemma codicum and explains how the loss of the figurae (original drawings) forced medieval copyists to alter the literal text.

- Krinsky, Carol Herselle. "Seventy-Eight Vitruvius Manuscripts." *Journal of the Warburg and Courtauld Institutes* 30 (1967): 36–70. https://doi.org/10.2307/750736. — A fundamental survey of the manuscript transmission.
- Kruft, Hanno-Walter. *Geschichte der Architekturtheorie: Von der Antike bis zur Gegenwart*. Munich: C. H. Beck, 1985. — A historical survey of architectural theory and the reception of Vitruvius.
- Reynolds, L. D., ed. *Texts and Transmission: A Survey of the Latin Classics*. Oxford: Clarendon Press, 1983.
- Rose, Valentin, ed. *Vitruvii de architectura libri decem*. 2nd ed. Leipzig: B. G. Teubner, 1899. — A major critical edition, with a recension and apparatus used for comparison in this volume.
- Ruffel, Pierre, and Jean Soubiran. "Recherches sur la tradition manuscrite de Vitruve." *Pallas* 9 (1960): 3–154. https://doi.org/10.3406/palla.1960.972. — A substantial study of the manuscript tradition.

Theoretical Application

This list of manuscripts is the material testimony of how the argumentative structure of this work was saved:

Harley MS 2767 belongs to the first quarter of the ninth century and bears witness to the Carolingian preservation of technical literature. The British Library catalogs Cologne or Aachen as possible places of origin and treats an association with Charlemagne's palace scriptorium as conjectural. Within the interpretive argument of this work, the survival of Vitruvian geometry can illuminate later ideas of order and renovatio; the manuscript's date and possible

provenance do not, by themselves, demonstrate direct imperial patronage or a particular political purpose for its copying.

Vitruvius and his Work

John Ruskin's quotation, while methodologically brilliant in contrasting the 19th-century view with the classical one, introduces a dichotomy (*architect vs. builder*) that did not exist in that form in the Roman world: for Vitruvius, the architect *is* the ultimate builder because he masters both *fabrica* (manual practice) and *ratiocinatio* (mathematical theory). Furthermore, in the last paragraph, it is crucial to clarify that for Vitruvius, architecture does not imitate nature in its formal or ornamental aspects, but rather in its **operational principles and rational laws** (tectonic mimesis).

"In the programmatic design of De architectura, Vitruvius (c. 80–15 BCE) configures the building discipline not as an empirical or sectoral craft, but as an encyclopedic and unifying episteme. By assigning it a primordial epistemic character, the treatise writer maintains that architecture subsumes and structures practically all areas of human knowledge. For Vitruvius, excellence in architectura demands a bidirectional training founded on the symbiosis of fabrica (executive practice) and ratiocinatio (the theoretical and mathematical demonstration of proportions). This universal propaedeutic requires of the architect a rigorous mastery of a broad spectrum of disciplines:

- **Geometry (*Geometria*):** An indispensable instrumental axiom for the delineation of plans (*ichnographia*), elevations (*orthographia*) and perspectives (*scaenographia*), guaranteeing the exact translation of abstract diagrams into physical space.
- **Mathematics (*Arithmetic*):** Foundation of modular metrology and cost calculation, essential for the computation of symmetries and proportionality relationships that ensure tectonic stability against material loads.
- **Anatomy and Medicine (*Medicine*):** An analytical prescription that governs sacred anthropometry — synthesized in the canon of *homo bene figuratus* — and urban health. It includes the study of climatic vectors, water quality, and the sanitation of residential districts.
- **Optics and Acoustics (*Optice et Musica*):** Physical knowledge applied to the correction of optical illusions in the entablatures and tonal

calibration of the theaters through the harmonic use of resonating vessels or *echeia*.

- **Law (*Iura*):** Knowledge of Roman civil and urban planning jurisprudence, regulating easements of light, drainage, party walls and construction contracts to avoid tax disputes.
- **Theology and Astrology (*Theologia et Astrologia*):** Doctrines that determine the correct observance of decorum (*decor*), ensuring that the typologies of the temples correspond to the ontological attributes of each deity, as well as for the layout of the solar quadrants (*gnomonica*) and the cosmic orientation of the oracular cellas.
- **Meteorology (*Caeli Ratio*):** Microclimatic analysis of the geographical environment that determines the orientation of openings, the thickness of walls and ventilation systems according to the prevailing winds.

The Historical Dialectic of Design and Tectonic Mimesis

This holistic vision of the architect as a universal sage contrasts with the aestheticist derivations of modernity. Centuries later, the 19th-century critic John Ruskin would condense the Romantic turn by stating that "*no one who is not a great sculptor or painter can be an architect; if he is not, he can only be a builder*." For Vitruvian pragmatism, however, beauty (*venustas*) is not a plastic ornament superimposed by the fine arts, but a mathematical property emerging from correct structural arrangement.

In Vitruvian cosmology, architecture operates under the principle of mimicking nature, not through the slavish copying of its biomorphic forms, but through the emulation of its laws of efficiency and protection. Just as birds and bees configure their nests in response to instinctive needs for preservation, primitive humanity erected the primitive hut as a primary refuge against the harshness of the elements. The transition from this primitive organic functionalism to the refinement of the art of building was completed when Hellenic civilization translated the tectonics of wood into the laws of stone, canonizing this process through the invention of the architectural orders: the structural vigor of the Doric, the golden elegance of the Ionic, and the vegetal exuberance of the Corinthian.

Critical Notes

1. **The Vitruvian-Ruskin Tension: It** is excellent to introduce Ruskin. Ruskin writes from the perspective of Romanticism and the *Gothic Revival*, where the architect is an individual artist and the builder is a mere industrial worker. For Vitruvius, this separation is an aberration: the *fabric* (knowing how to lay the bricks) and the *ratiocinatio* (knowing why they are laid) form an indissoluble unity. By recovering this Roman sense, this edition advocates a return to the unity of thought and matter.

2. **The Primitive Hut as Archetype:** Vitruvius's account of the origins of architecture (Book II) is the foundation of all Western architectural theory (later revisited by Laugier in the 18th century). The hut of logs and leaves is the "womb" of architecture. The Greeks did not invent the orders from nothing; they petrified the wooden structure of the hut (the triglyphs of the Doric order are the stony memory of the original beam ends). Architecture is, therefore, an alchemical transmutation: converting the ephemeral wood of nature into the eternal order of geometric stone.

3. **The concept of *Decorum*:** In the theology section, it is essential to use the Vitruvian technical term Decorum**.** Decorum is the mystical suitability of the building to its function. Vitruvius explains that a temple to Minerva, Mars, or Hercules should be Doric (robust, austere, masculine), while a temple to Venus, Flora, or Proserpina should be Corinthian (delicate, slender, ornamental). The architectural order is not chosen for aesthetic taste, but for a cosmic correspondence with the energy of the divinity that will inhabit the space.

" Vitruvian epistemology finds its operative core in the indissoluble symbiosis between *fabrica* and *ratiocinatio*. Vitruvius rigorously warns that those practitioners who devoted themselves exclusively to manual skill (*fabrica*) without the aid of letters failed to achieve an authority commensurate with their efforts; conversely, theorists who took refuge solely in abstract reasoning (*ratiocinatio*) pursued a shadow instead of material reality. Consequently, the architect of excellence is defined as that scholar capable of transmuting theory into practice, governing their activity by an encyclopedic knowledge that unifies the exact sciences, the liberal arts, and the humanistic culture of the *imperium*. "

This systematic approach unfolds with architectural rigor in the internal structure of *De architectura*, a corpus divided into ten books or volumes (*volumina*). Each section opens with a *proemium (preface) of profound philosophical* and historical depth that legitimizes the subsequent topic in light of the figure of Emperor Augustus. It is in Book I that the author establishes the three ontological and immutable vectors that must govern all construction, universally known as the **Vitruvian triad**:

- ***Firmitas* (Solidity):** Guaranteed by the scientific selection of materials, the firmness of the foundations (*substructio*) and the correct distribution of structural loads without blindly relying on empirical resistance.
- ***Utilitas* (Utility or Functionality):** Achieved through the functional and obstacle-free arrangement of the plants, ensuring that the distribution of spaces accurately reflects the public or private use for which they are intended.
- ***Venustas* (Beauty or Grace): An** aesthetic emergence that is consolidated when the appearance of the plane is pleasing and harmonious, based on the laws of proportion (*proportio*) and the modular correspondence of the *homo bene figuratus, whose* geometric translation would inspire the Renaissance canon of Leonardo da Vinci.

Dispositio Textus: Analytical Structure of the Ten Books

The architecture of the Vitruvian treatise is structured according to the following thematic and philological ordering:

Table 2. *Analytical structure of the ten books (dispositio textus)*

Book	Traditional Thematic Rubric	Epistemological and Technical Content
Book I	*On Architecture and the Planning of Cities*	Encyclopedic training of the architect; the theoretical triad; foundations of urban planning, castrametation and the defense of cities.
Book II	*On the Properties of Materials*	Archaeology of the primitive hut and evolution of housing; physical-chemical study of building materials (sand, lime, *pozzolana*, brick and wood).
Book III	*De sacrorum aedium symmetria*	Theory of body proportions and anthropometry (homo *bene figuratus*); typologies of the classical temple and symmetries of the Ionic order.

Book	Traditional Thematic Rubric	Epistemological and Technical Content
Book IV	*De corinthio et dorico ordine*	Continuation of sacred treatises; genesis and laws of the Doric and Corinthian orders; proportions of altars and cellas.
Book V	*De publicis locis*	Civil and institutional architecture of the forum; basilicas (with special attention to the Basilica of Fano); acoustics and geometry of theaters (*echeia*).
Book VI	*De privatis aedificiis*	Domestic building; the Roman *domus* and the suburban villa; adaptation of housing according to social condition and climate.
Book VII	*De expolitionibus*	Surface treatment; plastering techniques, stucco, paving and the chemistry of decorative pigments.
Book VIII	*De aqua*	Hydraulic engineering; prospecting, collection, leveling and distribution of water; construction of aqueducts and cisterns.
Book IX	*De gnomonica*	Applied cosmos sciences; elementary astronomy, lunar phases, meridian plotting and construction of sundials and water clocks.
Book X	*Of machines*	Mechanics and polyorcethics; kinematic lifting devices, pneumatic hydraulics and manufacture of torsion artillery (ballistae*).*

Through this rigorous compartmentalization of knowledge, *De architectura consolidates itself as a living organism where each book acts as a modular block. The work demonstrates that the act of designing* a simple brick (Book II) or calibrating a siege ballista (Book X) participates in the same mathematical matrix and the same rational order that governs the movement of the stars in the firmament (Book IX), configuring a true cosmology of construction.

Critical Notes

1. The Interdependence of the Triad: It is crucial to emphasize that *firmitas*, *utilitas,* and *venustas* are neither optional nor divisible. In the Roman mindset, beauty (*venustas*) is not a superficial aesthetic added at the end; it is the direct result of the building being solid (*firmitas*) and perfectly fulfilling its function (*utilitas*). The proportion that makes a temple beautiful is the same mathematical proportion that prevents its dome or entablature from collapsing.

2. The Descending Order of Knowledge: The geometric beauty of the treatise's structure. Vitruvius begins in **Book I** by examining the entire territory

(the macrocosm of the city) and ends in **Book X** by analyzing the tooth of a gear or the rope of a catapult (the microcosm of the machine). There is a conscious descent from the divine laws of heaven and temples (Books III and IV) to the humble matter of the earth and military technology (Books VII and X).

3. **The Link of Book II to the Origin:** The transition from Book I to Book II is pivotal to the treatise's argument concerning development. Vitruvius introduces the materials (sand, stone, wood) immediately after explaining what a city is, because the raw material must be consecrated by the architect's *logos* before becoming a wall or temple. The clay of the earth is elevated to the category of classical order through the geometric intervention of the sage.

- **Book V (*De publicis locis*):** Volume devoted to institutional architecture and the organization of civic meeting spaces. The author systematizes the proportions of the forum, the typology of the forum basilica (inserting his own construction experience in Fano) and, most importantly, the physics of theaters, where he introduces the science of harmonic acoustics and the optical optimization of the seating areas.
- **Book VI (*De privatis aedificiis*): Treatise dedicated to** domestic architecture and the organization of private space. Vitruvius analyses the climatic orientation of rooms, the typologies of the *atrium* of the Roman *domus*, and the configuration of suburban villas, establishing that the dwelling should reflect the socioeconomic condition and the decorous status of its owner.
- **Book VII (*De expolitionibus*): A** technical monograph focused on the arts of finishing and coating materials. It describes with engineering precision the preparation of mortar, the execution of high-strength pavements, the plastering of stuccos, and the mineral and vegetable chemistry for obtaining imperishable decorative pigments.
- **Book VIII (*De aquis*): Section dedicated to** hydraulic engineering (*aquarum ductus*). Vitruvius addresses the geological prospecting of springs, the medicinal properties of waters, the methods of topographic leveling using the *chorobates*, and the technologies of conduction through masonry channels, lead pipes (*fistulae)*, or clay (*tubuli*).
- **Book IX (*On Gnomonics*):** A cosmological and physical -mathematical digression that links architecture with the celestial order. The author explains the foundations of geocentric astronomy, the movement of the

stars, and the geometry of analemmatic projections indispensable for the design of sundials (*horology*) and mechanical water clocks.

The Paradox of the Lost *Figures* and the Hermeneutics of Space

In terms of textual transmission, the definitive loss of the original graphic apparatus that complemented Vitruvius's manuscript constitutes one of the most influential phenomena in the history of Western architectural theory. Throughout his ten books, the author explicitly refers to diagrams and illustrations (*figurae*) —originally placed at the end of the papyrus scrolls — intended to visually clarify the complex geometric formulas of the orders, the eurhythmy of the facades, or the mechanisms of the lifting machines.

The disappearance of this visual atlas during the early medieval manuscript copying process transformed *De architectura* into a purely abstract and conceptual text. However, far from diminishing its relevance, this absence of images became the main driving force behind European architectural thought. Lacking a single, unambiguous graphic model, architects and humanists — from Fra Giocondo and Cesare Cesariano to Andrea Palladio — were compelled to reinvent, draw, and design the treatise, forcing a dialectical confrontation between classical text and archaeological ruins. This hermeneutical gap transformed a rigid military manual from the Augustan era into a living, inexhaustible, and foundational text for the history of Western science and aesthetics.

Critical Notes

1. The precision of Book VII: Maintaining pavements and plasterwork in Book VII. Vitruvius explains that a good plaster requires up to six layers of mortar made from lime and powdered marble. This is not merely decoration; it is the pursuit of **material perfection**. The wall should reflect light like a mirror. *Venustas* (beauty) is achieved when the craftsman's physical technique elevates opaque matter to a state of pure luminosity.

2. The *Chorobates* and the Leveling of the Land: In Book VIII, the use of the *chorobates* (a twenty-foot-long wooden ruler with plumb lines and a water channel for leveling) represents the imposition of the horizontal straight line upon the irregularity of the land. For water to flow to the city, the engineer must correct nature. Vitruvian hydraulics is, therefore, a branch of applied geometry that purifies and orders the land.

3. **The Analemma of Book IX:** The design of sundials using the *analemma* is mathematical proof that Roman architecture is a cosmological science. The architect projects onto the plane of the earth the shadows cast by the sun on its annual journey through the zodiac. A well-oriented Vitruvian building is not isolated from its surroundings; it is an astronomical instrument that beats in unison with the time of the universe. The space of architecture and the time of the stars are unified under the rule of the treatise writer.

Translation (1847), published in Paris by Panckoucke, is one of the cornerstones of 19th-century French philology. Maufras's great merit was to strip Vitruvius's text of the overly romantic interpretations of his time, restoring the technical rigor and military pragmatism of the Latin original. In line with contemporary editorial standards, chapter titles are standardized by combining Maufras's 19th-century rubric with modern technical-legal and archaeological concepts (such as the distinction between publica and privata in urban land-use planning).

STUDY OF THE TEN BOOKS

Academic Restitution and Writing (Books I and II)

The structural breakdown of the first two books of *De architectura* reveals the epistemic matrix upon which Vitruvius builds the entirety of his treatise. Far from constituting a mere summary of trades, the index of these foundational books traces the ontological transition that runs from the training of the scholar and the geopolitical delimitation of territory (Book I) to the physico-chemical analysis of raw materials and the anthropology of building (Book II).

The systematic organization of these chapters is reconfigured under the following academic standard:

BOOK I: De architectura et de urbis ordinatione
(From architectural science and the organization of urban space)

- Chapter I: The epistemology of building and the propaedeutics of the architect. Definition of the discipline through the coexistence of the *fabric* and the *ratiocinatio*; breakdown of the encyclopedic training of the professional.
- Chapter II: The constitutive axioms of architecture. Analysis of the six theoretical principles that govern classical design: *ordinatio* (arrangement), *dispositio* (arrangement), *eurythmia* (eurhythmy), *symmetria* (symmetry), *decor* (decorum) and *distributio* (distribution or economy).

- Chapter III: The parts of architectural science and the ontological triad. Division of knowledge in the construction of buildings (*aedificatio*), gnomonic (gnomonice*)* and mechanics (*machinatio*). Introduction of the three universal requirements: *firmitas*, *utilitas* and *venustas*.
- Chapter IV: Environmental Teratology and Selection of Urban Sites (*De electione locorum sanissimorum*). Hygienist and Hippocratic Criteria for the Founding of Cities; Analysis of Winds, Marsh Fogs, and the Salubrity of Humours.
- Chapter V: Poliorcetics and Fortification: The erection of walls and towers. Deep foundation techniques (substructio*)* and defensive geometry to repel enemy siege engines.
- Chapter VI: Climatic urbanism and street orientation. Street layout and interpolation of walls based on the wind rose (*anemometry*) to neutralize harmful currents in public space.
- Chapter VII: Sacred and civil zoning (*Dispositio moeniorum*). Spatial distribution and allocation of plots for the temples of the immortal gods and the common spaces of the citizens according to liturgical decorum.

BOOK II: De materiae facultatibus

(From the physical and chemical properties of materials and the origin of tectonics)

- Chapter I: Cultural Anthropology and the Genesis of Building. Account of the primitive hut; the domestication of fire as the origin of human society and the transition from the cave to the geometric order.
- Chapter II: Cosmology of the elements according to the philosophical schools. Theory of matter based on the pre-Socratic principles (Thales' water, Anaximenes' air, Heraclitus ' fire and Democritus' atoms) as the key to understanding building materials.
- Chapter III: The adobe brick (*De lateribus*). Modular typologies (Lydian, pentador, tetrador), seasonal drying processes and quality control of clay.
- Chapter IV: Sand (*From harena).* Mineralogy classification of quarry sands (*fossicia*), river sands (*flumina*) and sea sands (*marina*), and their suitability for mortar cohesion.

- Chapter V: Lime (*From calce*). Chemistry of the calcination of limestone and the agglomeration of the stone components.
- Chapter VI: Pozzolan (*De pulvere puteolan*). The discovery of volcanic dust from the regions of Baiae and Vesuvius; the technological miracle of hydraulic setting (mortar capable of solidifying underwater).

Critical Notes

1. On the rendering of pulvere puteolanum: the Roman term *pulvere puteolanum* corresponds directly to modern pozzolana. This chapter (II.6) is among the most important in the history of Roman civil engineering: pozzolana allowed the Romans to build ports, docks, and bridge foundations submerged directly in water, breaking the limitation of Greek architecture, which always relied on dry rock.

2. Chapter VI of Book I as cosmic geometry: The layout of streets according to the winds was not merely a matter of convenience. Vitruvius describes the placement of a *gnomon* (a vertical pillar) in the center of the future city to mark the line of the shadow in the morning and afternoon. By joining these points, the East-West line was obtained, and from there the city was divided into a perfect octagon corresponding to the eight principal winds. The Roman city is, therefore, an inhabited sundial, a sacred space perfectly oriented with the axes of the cosmos.

3. From Atom to Brick: In the order of the chapters of Book II, Vitruvius does not jump directly to explaining how to build a wall; he first dedicates an entire chapter (Chapter II) to the philosophy of matter. He explains that to be a good architect, one must understand the behavior of the four elements of nature, because brick, lime, and wood expand, contract, and react according to the invisible laws of pre-Socratic physics. Knowledge always precedes technique.[100]

Books III and IV of *De architectura* constitute the dogmatic core of the theory of sacred design in Antiquity. Vitruvius articulates a system where beauty (*venustas*) is not a subjective criterion, but an emergent mathematical property based on the **module** (M). Book III takes the human microcosm as its starting

100Pozzolans are siliceous or aluminosiliceous materials of volcanic origin which, mixed with lime, set in the presence of water. They are fundamental to Roman opus caementicium.

point to dictate the laws of the Ionic order, while Book IV expands this grammar to encompass the vigor of the Doric and the slenderness of the Corinthian, establishing altar typologies according to liturgical decorum.

The systematic organization of these chapters is established under the following academic standard:

BOOK III: De sacrorum aedium *symmetria*
(On the symmetries and proportions of sacred temples)

- **Proem:** Apology for the merits of the architect in the face of the injustice of political favor; the immortality of classical treatise writers through the written word.
- **Chapter I: Anthropometry as the matrix of sacred design (*homo bene figuratus*).** Study of the proportions of the human body and its exact inscription in the perfect figures of the circle and the square; derivation of the perfect numerical system (6, 10 and 16) from anatomy.
- **Chapter II: Typological classification of temples according to their facades.** Geometric definition and distribution of the colonnade: temple in amphiprostyle, prostyle, in antis, dipterous, pseudodipterous and peripterous.
- **Chapter III: Classification of temples according to the intercolumniation (*Modulatio*).** Analysis of the five types of temples based on the distance between columns measured in modules: *pycnostylos* (thick), *systylos* (narrow), *diastylos* (wide), *araeostylos* (dilated) and *eustylos* (ideal harmonic proportion).
- **Chapter IV: Stereobate and deep foundation (*De fundamentalis*).** Excavation techniques and foundation engineering in firm soil or artificial ground using charred wooden piles; construction of the steps (*stylobata*) and the calculation of the *odd scamilli* to correct the optical illusions of subsidence on the horizontal line.
- **Chapter V: The Ionic Order: From the shaft to the entablature.** Laws of proportion of the Ionic column: the layout of the base, the reduction of the shaft by means of the *entasis* (optical curvature), the geometric design of the volute of the capital, and the measurements of the architrave, the frieze and the cornice.

BOOK IV: De corinthio et dorico ordine

(On the architectural orders and the arrangement of the cellas)

- Proem**:** Justification of the continuity of Book III; the need to exhaust the study of the three architectural orders of Hellenic tradition before addressing civil spaces.
- **Chapter I: The Corinthian Order and the Mythological Genesis of its Proportions.** Origin of the Corinthian capital through the anecdote of Callimachus in Corinth and the acanthus basket on the maiden's tomb; analysis of the slenderness of the order as an imitation of the graceful figure of a virgin.
- **Chapter II: Archaeology of wood and the petrification of the Doric order**. Exegesis **of** tectonic mimesis; how the stone elements of the Doric order (triglyphs, metopes, mutules and drops) are the direct translation and memory of the beams, rafters and wooden joints of the primitive hut.
- **Chapter III: The metric laws of the Doric order and its design difficulties.** The problem of the corner triglyph (Doric angular conflict); exact distribution of modules in the metopes, columns and entablatures to avoid spatial asymmetry.
- **Chapter IV: Internal arrangement of the temple: The cella and the pronaos.** Geometric distribution of the interior walls, the proportions of the naves and the metric relationship **between** the space of the divinity and the exterior facade.
- **Chapter V: Cosmic Orientation of Sacred Architecture.** Astrological and Liturgical Prescription: The cellas of the temples must be inexorably oriented towards the west, so that the faithful approaching the altar face the east, from where the sunlight originates.
- **Chapter VI: The doors and openings of the temples.** Proportions and profiles of the openings according to three classical typologies: Doric, Ionic and Tuscan (Attic).
- **Chapter VII: The temples of the Tuscan order (*De tuscanicis aedibus*).** Structural features and proportions of the temple of Italic or Etruscan tradition, characterized by its wide wooden eaves and its almost quadrangular plan.
- **Chapter VIII: Circular Temples and Altars of the Gods.** Geometry of centrally planned temples (*tholos*) and round peripteral temples; rules for the erection of altars (*arae*) placed according to the celestial, terrestrial, or chthonic rank of the invoked deity.

Critical Notes

1. The *Scamilli Impares as* a Geometric Secret: In Book III, Chapter IV, Maufras translates the technical term scamilli *impares* as "unequal bearings." This is one of the most debated passages among Renaissance architects. It refers to the subtle upward curve given to the stylobate (the temple platform). If the platform were perfectly straight in the geometric plane, the human eye would perceive it as sunken due to an optical distortion. By curving it slightly towards the center, the temple appears perfectly stable and regular to the observer. True symmetry requires curving the material straight line.

2. The Doric Angular Conflict as a Mathematical Dilemma: Chapter III of Book IV explains why Greek architects (such as Tarcesius) abandoned the Doric order for the Ionic: due to the rigidity of the triglyph. By law, a triglyph must be positioned exactly over the center of each column and the center of each intercolumniation. However, at the corners of the temple, the triglyph must be placed at the very edge of the frieze, which misaligns the last metope. This dilemma forced the shift from a two-dimensional approach (the façade) to a three-dimensional adjustment of the intercolumniation (corner contraction). Classical geometry prefers to change the physical module rather than disrupt the visual harmony of the whole.

3. The Altar as a Cosmic Interface: The final chapter of Book IV eloquently concludes the hypothesis concerning Delphi and the archetypes. Vitruvius details that the altars of Jupiter and the celestial gods should be elevated; those of Gaia and the underworld (*chthonic) deities* should be rustic and at ground level; and those of the water nymphs should be intermediate. The altar is the vanishing point where the geometry of the temple communicates with the invisible forces of nature, the same principle that united the ashes of the serpent Python beneath the *oracular omphalos of* Delphi.

From the interior of the cells and the distribution of the pronaos[101].
Regarding the orientation of the temples.
Temple doors and door frames; their proportions

101Pronaos (πρόναος, from πρό, 'before', and ναός, 'temple') denotes the space in front of a temple's naos or cella. It forms the temple's vestibule or entrance and commonly continues the cella's principal axis. The Latin forms are borrowings from Greek, not the source of the Greek word.

of the Tuscan order[102].

We now turn to the middle block of the corpus: Books V, VI, and VII. In these books the text makes the great leap from the rigidity of sacred architecture to the flexibility of Roman civil life and technological pragmatism. The transmission of the passage concerning the palaestra requires care: corrupt readings may obscure its reference to the covered porticoes called xysti (xystos). The title of Book VII, *De vitiis*, likewise denotes the defects and faults of construction, not any matter of conduct or instruction.

"Books V, VI, and VII of *De architectura* depict the transition from the cosmic space of the gods to the anthropocentric stage of the Roman citizen. Book V regulates the monumentality of the civil fabric (theaters and ports); Book VI theorizes about domestic intimacy (the *domus* and the villa), adapting it to the climate and social status; and Book VII functions as a rigorous manual of applied chemistry, analyzing coating techniques and the nature of pigments."

The organization of these chapters under a contemporary critical standard is structured as follows:

BOOK V: De publicis locis

(Of civil architecture and monumental public spaces)

- **Proem:** Justification of the brevity of technical books; defense of the plain and instructive style against the traditional literary rhetoric of philosophers.
- **Chapter I: The Roman Forum and the legal basilicas**. Proportions of the forum in relation to gladiatorial spectacles; geometry of the judicial basilica and case study of the lost Forensic Basilica of Fano erected by Vitruvius himself.
- **Chapter II: State Logistics: The Treasury, the Prison and the Curia**. Technical arrangement of the offices of the public treasury (*aerarium), the state prisons and the* town hall or municipal palace (*curia*), guaranteeing their visual harmony with the forum.

102The Tuscan arrangement described by Vitruvius at 4.7 derives from the Etrusco-Italic temple: a column with a simple base, an unfluted shaft and an undecorated capital, with robust proportions. Renaissance theorists, including Serlio, Vignola and Palladio, codified it as the first and simplest of the architectural orders.

- **Chapter III: The Theater: Environmental Hygiene and Seating Geometry.** Criteria for selecting the theater site; exclusion of unhealthy areas to protect the throat and breathing of spectators from harmful air currents.
- **Chapter IV: Science of music and canonical harmony.** Mathematical digression based on the Pythagorean theories of Aristo Xeno; division of musical intervals (harmonic, chromatic and diatonic) essential for architectural acoustics.
- **Chapter V: The resonating vessels of the theater (*Echeia*).** Symmetrical placement of bronze or clay vases in niches under the seats; tonal calibration in intervals of fourth, fifth and octave to mechanically amplify the human voice.
- **Chapter VI: Geometric layout of the Roman theater.** Inscription of four equilateral triangles within a regular circle to determine the width of the stage (*proscaenium*), the pulpit (*pulpitum*) and the accesses of the orchestra.
- **Chapter VII: Design Variations: The Greek Traditional Theater.** Metrical differences with the Roman model; expansion of the orchestra and reduction of the stage for the Hellenic chorus.
- **Chapter VIII: The roof and porticoes of the theater stage.** Aerial acoustics of the stage; inclination of the upper roofs and their function as reflectors of sound waves.
- **Chapter IX: Public walkways and post-stage porticoes. Design** of porticoes behind the theater (*porticus post scaenam*) as a refuge for citizens from sudden rain; planning of green areas and tree-lined walkways for their therapeutic and hygienic virtues.
- **Chapter X: The Baths: Hydraulics and thermodynamics of the Roman bath.** Arrangement and solar orientation of the saunas and pools; construction technique of the hypocaust (*hypocastum* or radiant floor) and distribution of the *caldarium*, *tepidarium* and *frigidarium*.
- **Chapter XI: The Palaestra: Architecture of athletics and the *Xysti*.** Organization of the training courtyards; design of the covered porticoes or xysti *intended* for physical exercise during the winter.
- **Chapter XII: Port engineering and submerged hydraulic structures.** Construction of docks, dikes and breakwaters; use of wooden caissons (**arcae***)* for water drainage and application of pozzolan hydraulic mortar for the solidification of concrete underwater.

BOOK VI: De privatis aedificiis
(On domestic architecture and the organization of private buildings)

- **Proem:** Praise of education and knowledge as the only wealth that survives the shipwreck; the dignity of the profession in the face of the speculation of upstart builders.
- **Chapter I: Architectural Climatology and Medical Geography. Suitability** of dwellings according to the latitude of the *imperium; thick walls and shady orientations for the southern provinces (Egypt), and wide openings oriented* **to** the south for the cold northern regions (Gaul and Germania).
- **Chapter II: Eurythmy and optical corrections in residential scale.** Modification of theoretical proportions based on the actual dimensions of the plot, ensuring that the eye perceives the rooms as balanced despite the constraints of the terrain.
- **Chapter III: Anatomy of the *Domus*: From the Atrium to the Peristyle. Modular** typologies and measurements of the *cavaedium* or atrium (Tuscan, Corinthian, tetrastyle, displuviate and testudinate); dimensions of the wings (*alae*), the office of the *pater familias* (*tablinum*), the dining rooms (*triclinia*) and the reception rooms (*exedrae*).
- **Chapter IV: Heliothermal orientation of private rooms.** Prescription for health and comfort: bedrooms and libraries should face east to take advantage of the morning light; winter dining rooms should face west to capture the heat of the sunset; and art galleries or painting galleries should face north to maintain a constant luminosity that does not degrade the colors.
- **Chapter V: Sociology of residential space.** Distribution of housing in relation to the public rank of the inhabitant; need for majestic **private** vestibules and basilicas for magistrates and nobles who receive clients, versus modest houses for moneylenders or artisans.
- **Chapter VI: Rural Architecture: The *Rustic Villa*.** Planning of farms and country houses; arrangement of stables, wine cellars, oil presses (*torcularia*) and barns according to ventilation and prevention of dampness.
- **Chapter VII: The Hellenic house and its differences with the Roman one.** Structure of the Greek house; strict division between the gynaeceum (women's space) and the andronitis (men's hall); the porticoed courtyards, foreign to the Italic atrium system.

• **Chapter VIII: Structural Engineering of Residential Foundations.** Guidelines for ensuring structural stability and avoiding construction defects in load-bearing walls and archways.

BOOK VII: De expolitionibus

(From coatings, structural pathology, and pigment chemistry)

• **Proem: History of** technical and scientific literature; catalog of the great treatise writers of classical antiquity (the great bibliographical digression on literary plagiarism and optics).

• **Chapter I: Pavement and soil engineering. Soil** foundation techniques; placement of the stone layer (*statumen*), the mortar core (rudus*)* and the final mosaic or marble plaster (*nucleus*) to prevent settlement cracking.

• **Chapter II: Scientific preparation of lime for fine stucco.** Prolonged slaking process of the lime; mixing and maturation techniques of the paste to avoid granulation that ruins the surfaces.

• **Chapter III: Construction of vaulted ceilings and plastering.** Creation of false vaulted ceilings using reed trusses and wooden profiles; application of the three layers of sand mortar and the three layers of marble dust to achieve a reflective finish.

• **Chapter IV: Building Pathology: Treatments against Dampness.** Solutions for walls in contact with damp ground; erection of double walls with **air** chambers (*muri duplicati*) and drainage channels to isolate the painting rooms.

• **Chapter V: Theory and decline of mural painting. Rules for the decoration of rooms; evolution of pictorial styles and Vitruvius' severe moral criticism against the rise of the fantastic and whimsical frescoes of the "Third Style" (monsters, impossible architectures) to the** detriment of classical realistic mimesis.

• **Chapter VI:** Preparation **of marble powder. Marble grinding** techniques to achieve the characteristic shine and mirror polish of noble stuccos.

• **Chapter VII: Mineral pigments and natural colors.** Location and extraction of chromatic earths: ochres, clays and green earths extracted directly from the imperial quarries.

• **Chapter VIII: The Metallurgy of Cinnabar and Mercury.** Physical properties of bismuth ore and extraction of quicksilver or liquid mercury from the Almadén mines.

- **Chapter IX: Preparation and Fixation of Artificial Cinnabar.** Laboratory processes for purifying the intense red pigment (vermilion) and encaustic techniques with beeswax (*punica*) to protect it from degradation by sunlight.
- **Chapter X: Artificial pigments and the chemistry of fire.** Manufacture of carbon black by controlled combustion of resins in special furnaces.
- **Chapter XI: Alexandrian Blue and Burnt Ochre.** Metallurgy of copper silicate blue (Egyptian blue) invented in Alexandria and the thermal roasting process of yellow ochre to transform it into deep red.
- **Chapter XII: Chemical Corrosion Processes: Whitewash, Verdigris, and Minium.** Obtaining lead white (*cerussa*) and copper green by exposing metals to vinegar vapors; production of minium from heating lead.
- **Chapter XIII: Imperial Purple and Marine Mollusks.** Extraction of **the** most valuable dye of antiquity from the glands of murex snails, *intended* exclusively for the decoration of emperors and the highest-ranking temples.
- **Chapter XIV: Substitution Pigments and Adulterations.** Techniques for imitating purple and expensive colors using cheap vegetable dyes (madre root, yellow) mixed with **gypsum**.

Critical Notes

1. **The Palaestra and the Xysti. The technical term xystos (plural xysti) denotes covered porticoes discussed in Book V, Chapter XI.**Xystos were the covered, elongated porticoes where Greek and Roman athletes trained during winter storms. The technical vocabulary of the palaestra belongs to the spatial organization of ancient gymnastic architecture and its reception in the Augustan cultural setting.

2. On the title of Book VII (*De vitiis*): the phrase denotes the material defects, hidden flaws, and faults in the execution of a work — not pedagogy or morality. Chapters I and IV of Book VII treat of how a careless mason who fails to slake the lime properly, or who does not protect the walls from ground damp, ruins the physical fabric of the wall. It is, in the strict sense, the engineering of construction pathologies.

3. **Third Pictorial Style as Geometric Transgression: Chapter** V of Book VII contains Vitruvius's famous moral complaint against the painters of

his time. Vitruvius hated the fantastic Pompeian style because it depicted thin reeds supporting heavy roofs, or human figures sprouting from flowers. For him, this was a **violation of structural truth**. If a reed cannot support a roof in material reality (*firmitas*), painting that reed supporting a roof on the wall is an aesthetic lie that destroys *ratiocinatio*. Decoration must be subordinate to the immutable laws of physics and statics.

These two books demonstrate that Roman architecture was not confined to the earth's surface: Book VIII descends into the depths of the crust through hydraulic engineering, while Book IX rises to the celestial vault through analemmatic and gnomonic astronomy. It is essential to clarify that Vitruvius's astronomical digression is not an ornamental addition, but the necessary mathematical basis enabling the architect to measure time (sundials) and to orient buildings with respect to the solstices and equinoxes.

" Books VIII and IX of *De architectura* represent the expansion of the discipline of building to encompass the two great fluids of the cosmos: subterranean water and celestial light. Book VIII functions as a treatise on applied geology and fluid engineering, systematizing everything from hidden prospecting to the construction of cisterns; meanwhile, Book IX operates as a compendium of geocentric astrophysics, dictating the mechanical laws that allow the capture of the sun's shadow to regulate the time of civilization."

Contemporary analytical standard is broken down as follows:
BOOK VIII: *De aqua*
hydraulic engineering and water prospecting)

- **Proem:** Praise of water as the primordial element of the cosmos; its absolute necessity for the survival of life and ritual purity in the face of the other elements of nature.
- **Chapter I: Geological prospecting and detection of hidden sources (*De inventione aquae*).** Techniques of observing the terrain at dawn; analysis of indicator vegetation (rushes, willows, ivies) and methods of test excavation using inverted bronze vessels to capture the condensation of telluric vapor.
- **Chapter II: The hydrological cycle and rainwater.** Physics of evaporation and condensation; analysis of the purity and safety of rainwater compared to surface runoff or clay infiltration water.

- **Chapter III: Thermalism and chemical properties of springs.** Study of hot, sulphurous and mineral waters; analysis of the geological nature of the great rivers and lakes of the *imperium*, and their impact on the health of the populations.
- **Chapter IV: Water Teratology: Springs with extraordinary qualities.** Catalog of springs with psychotropic, toxic or medicinal effects depending on the minerals (acids, alkalis, iron) present in the underground strata.
- **Chapter V: Quality control and organoleptic analysis of water.** Methodology to verify the safety of the water before its channeling: visual inspection of the transparency, taste, speed of cooking of legumes and clinical examination of the physical constitution and viscera of the animals that inhabit the area.
- **Chapter VI: Topographic Leveling Engineering: The *Chorobates*.** Technical description and calibration of the chorobates (the twenty-foot-long leveling rule provided with plumb bobs and water channel) and of alternative optical instruments such as the *dioptra* and the water level (*libella*).
- **Chapter VII: Conduction systems, wells and cisterns of opus signinum.** Water transport techniques using three systems: masonry channels (*specus*), lead pipes (*fistulae*) operating on the principle of the inverted siphon (venter*)*, and fired clay conduits (*tubuli*). Methodology for excavating wells and waterproofing cisterns using beaten hydraulic mortar.

BOOK IX: De gnomonica
analemmatic astronomy, and sundials)

- **Proem: Praise to the inventors of** athletic games and to the wise men of letters; the preeminence of the mathematical discoveries of Pythagoras (his theorem), Democritus and Archimedes (the hydrostatic principle of the golden crown) as the true glories of humanity.
- **Chapter I: Geocentric Astronomy and the Zodiac System.** Configuration of the universe according to **the** model of the celestial spheres; the movement of the sun and the seven planets (wandering stars) through the twelve zodiacal constellations.

- **Chapter II: Selenography: The phases of the Moon.** Geometric explanation of the lunar waxing and waning according to the theory of the half luminous and half opaque sphere (theory of Berossus the Chaldean)**.**
- **Chapter III: Heliochrony: Solar declination and the variation of hours. Analysis of how the sun's transit through the signs of the Zodiac** modifies the length of days and nights, varying the duration of temporal (Roman) hours according to the seasons of the year.
- **Chapter IV: Northern Uranography: The Northern Constellations.** Catalog and coordinates of the stars located between the plane of the Zodiac and the north pole (Ursa Major, Ursa Minor, Draco and Boötes).
- **Chapter V: Southern Uranography: The Southern Constellations.** Description of the stars visible in the southern hemisphere, located between the Zodiac and the Antarctic pole (Orion, Canis Major, Argo Navis).
- **Chapter VI: Chaldean Astrology and Weather Prediction. Introduction to the sciences of** astral divination and meteorological forecasting based on planetary conjunctions and eclipses.
- **Chapter VII: Descriptive Geometry: Drawing the Analemma.** The fundamental mathematical method for projecting the three-dimensional curve of the sun's path onto a two-dimensional flat surface using a ruler and compass, serving as a matrix for any latitude on Earth.
- **Chapter VIII: Gnomonics: Typologies of sundials and water clocks.** Catalog of inventors and models of sundials (*horologia): the hemicycle of Berossus, the scaphe* **of** Aristarchus, the plinth of Scopinas, and description of the complex mechanisms of clepsydras or automatic water clocks driven by gears and regulated floats (inventions of Ctesibius).

Critical Notes

1. Opus *Signinum* and Roman hydraulic waterproofing: In Chapter VII of Book VIII, Vitruvius treats lime and cement cisterns. Philologically, the Roman term is ***opus signinum*** (lime mortar mixed with fragments of pottery and crushed tiles). The addition of the pottery triggers a chemical reaction that renders the mortar absolutely impermeable. This detail is technically significant: the channeled water is retained without seepage within a watertight lining of opus signinum.

2. **The analemma of Book IX: geometric projection in gnomonics:** Chapter VII of Book IX is a scientific core for the study of regulated space. The **analemma** is not an artistic drawing; it is a pure geometric construction that projects the apparent annual motion of the Sun, mapping it onto the two-dimensional plane of the dial. By mastering the analemma, the Roman architect could calculate the exact shadow a building would cast at any time of day and on any day of the year (equinoxes and solstices). The method thus allowed the architect to represent, on a plane surface, the geometry governing the Sun's apparent course throughout the year.

3. **The Inverted Siphon (*Venter*) and the Mastery of Gravity:** In Book VIII, Chapter VII, the description of the lead pipes crossing the valleys demonstrates that Roman engineers understood the physics of communicating vessels. To prevent water pressure from breaking the pipes at the bottom of the valley, they constructed a horizontal section called ***a venter*** (belly). Roman engineering did not evade the forces of gravity, but rather balanced them through the symmetry of the watercourse.

Astronomy is used to predict changes in the weather, and what will happen to men, based on the appearance of the stars at the time of their birth. How to make an analemma[103].

Since the invention of summer clocks or sundials; Clepsydras and winter or anaphoric clocks.[104] [105]

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103 In Vitruvius (9.1.1; 9.7), the analemma (ἀνάλημμα) is a geometrical projection used to lay out a sundial's hour lines. It is distinct from the figure-of-eight curve also called an analemma in modern astronomy.

104 **A clepsydra** (from the Greek κλεψύδρα, kléptein,"To steal, and ὕδωρ hydōr," water") is any mechanism for measuring time by the regulated flow of a liquid into or out of a graduated container, thus giving rise to two different types of clocks depending on the direction of the flow. Clepsydras date back to ancient Egypt (mrḫyt) and were used especially at night, when sundials were no longer useful. The earliest water clocks consisted of a ceramic vessel filled with water to a certain level, with a hole at the base of a suitable size to ensure the liquid flowed out at a specific rate and, therefore, in a predetermined time. The container had several markings inside, so that the water level indicated the different periods, both day and night.

105 Ctesibius (Κτησίβιος), active in third-century BCE Alexandria, was an inventor and hydraulic and mechanical engineer. The ancient tradition credits him with work on compressed air, pumps and the improvement of water clocks. His writings do not survive intact, and exact birth and death dates should not be inferred from the chronology of other Hellenistic scientists.

This final book distils Vitruvius's pragmatism in its purest form — that of a legionary military engineer. One technical term calls for care: the Latin *cochlea* must be rendered as the Archimedes' screw (the water-screw, or auger pump for raising fluids), not by any popular nineteenth-century equivalent. We also systematise the direct influence of this book on the seminal treatises of antiquity and the Renaissance.

Book X of *De architectura* crowns the work not as a technical appendix, but as the dynamic manifestation of physics and geometry applied to the service of the Roman state. Vitruvius breaks down the laws of elementary kinematics, distinguishing between large traction machines and precision devices, before turning to industrial hydraulics and military torsion ballistics, whose mathematical calibration depended directly on the geometric solution of doubling the cube.

The organization of these chapters is reconfigured under the following contemporary critical standard:

BOOK X: De machinis
(From mechanical science, fluid engineering, and poliorcetics)

- **Proem:** Ethical and economic considerations on the budgets of public works; the severe laws of the city of Ephesus that forced architects to answer with their own assets in case of financial deviations, and an apology for prudence in the administration of the State's resources.
- **Chapter I: Epistemology of mechanics and definition of machine. Conceptual** distinction between the machine (*machina), which requires the participation* **of** several operators and displays high mechanical performance, and the instrument or organ (*organum*), operated by the skill of a single individual.
- **Chapter II: Kinematic lifting and traction devices.** Description and breakdown of the loading cranes (*trispastos*, *pentaspastos* and *polyspastos*) used in temple construction; calculation of pulleys, winches, capstans and the physics of levers.
- **Chapter III: Kinematic Theory: The Straight Line and Circular Motion. Analysis of the physical principles of motion; how the combination of rectilinear and circular forces governs the** operation of all machines, exemplified in ship rudders and scales.

- **Chapter IV: Hydraulic lifting engineering: Drums and waterwheels.** Mechanisms designed to extract water from rivers and shallow wells by means of paddle wheels and compartmentalized drums powered by human traction (*tympana*).
- **Chapter V: Watermills and industrial waterwheels.** The automation of milling; description of the Roman angle gear that transmits the movement from the vertical shaft of the waterwheel to the horizontal shaft of the millstones for grinding the grain.
- Chapter VI: The Archimedes' screw (*cochlea*). Analysis of the water-screw: the geometric design of the helix wrapped about a wooden cylinder to raise large volumes of water through a low lift, as used in draining mines and fields.
- **Chapter VII: Ctesibius's impeller pump.** Pneumatics and precision engineering; description of the double - cylinder bronze machine provided with pistons, valves and suction pipes capable of raising water to great heights for fire extinguishing.
- **Chapter VIII: The Hydraulic Organ (*Hydraulus*).** The pinnacle of ancient mechanical precision; application of the laws of hydraulic pneumatics to regulate air pressure by means of water, making flutes and pipes sound through a mechanical keyboard.
- **Chapter IX: Odometry: Measurement of distances on land and sea.** Description of the mechanical odometer or classical taximeter; a system of reducing gears coupled to the wheels of a cart (or **to** the paddles of a ship) that dropped small bronze spheres into a container for each mile traveled.
- **Chapter X: Military Torsion Ballistics: Catapults and Scorpions.** Principles of Poliorcetics; Calculation **of** the diameter of the torsion cord module (made of tendons or human hair) based on the weight of the projectile or arrow that the scorpion was to fire.
- **Chapter XI: Engineering of the Ballista (*Ballistae*). Mathematical** proportions and calibration tables for the construction of large pieces of artillery intended for launching heavy stones to demolish walls.
- **Chapter XII: Calibration and tempering of torsion cords.** Methodology for symmetrically tensioning the arms of catapults and ballistae using acoustic nut wrenches, ensuring that both torsion modules vibrate with the same musical note to guarantee a straight trajectory for the shot.

Vitruvian Tradition and the Family Tree of Architectural Theory

The disappearance of the original *figures* (estimated at a minimum of ten modular plates affixed to the ends of the papyrus scrolls by Vitruvius himself) forced 16th-century editors to undertake a colossal graphic reconstruction. This hermeneutical effort gave rise to the creation of the great modern treatises, which adopted the Vitruvian theoretical framework and adapted it to the needs of their respective eras.

- **Pliny the Elder (*Natural History*, 1st century AD): An immediate** contemporary in the historiographical record. Pliny absorbed and indexed Vitruvius's mineralogical and metallurgical investigations (particularly the data in Book VII on cinnabar, lime, and marbles) within his books dedicated to geology and the plastic arts, validating the soundness of science during the time of Augustus.
- **Leon Battista Alberti (*De re aedificatoria*, 1452):** The first great treatise of Renaissance humanism. Alberti adopts the decemviral structure (ten books) and cardinal concepts of Vitruvius, but purifies the medievalized technical Latin of the Roman under the lens of Ciceronian prose and Platonic philosophy, transforming the Vitruvian triad into the supreme concept of *Concinnitas*.
- **Andrea Palladio (*I quattro libri dell'architettura*, 1570): The apotheosis of** visual codification. Palladio synthesizes Vitruvius's abstract theory and translates it into a practical system illustrated with engravings of perfect geometric symmetry. Through his four books, Palladio applies the module and proportions of Vitruvian temples (Books III and IV) to the design of urban palaces and residential villas, universalizing the classical canon in Western architecture.

Critical Notes

1. The *cochlea* (Archimedes' screw): the Latin *cochlea* designates the water-screw and must be rendered accordingly, not by any popular nineteenth-century term. It effects the transformation of continuous circular motion into an upward linear flow of fluid — one of the great achievements of applied helical geometry, showing that the Roman architect had mastered the principles of hydraulics.

2. **Music as a regulator of warfare:** Chapter XII of Book X. Vitruvius details how military engineers had to tune the catapult strings by musical ear. If one arm of the ballista was tighter than the other, the projectile would be deflected. This demonstrates that the *harmonic music* of Book V (designed for theaters) and the physics of warfare in Book X share the same **mathematical framework**. Music is not an art of entertainment; it is the physical law that balances both the voice in the sacred space and destructive energy on the battlefield.

3. **Odometry as the Metric of the Empire:** The invention of the odometer (Chapter IX) is the materialization of the control of Roman space. By inventing a machine that mechanically counts miles, architecture aligns itself with Agrippa's cartography: the untamed territory of the barbarian provinces is fragmented, measured, and dominated by the geometric regularity of the odometer. Measured space is space conquered by *Ratio*.

De architectura, Marcus Vitruvius Pollio; c. 80 – 70 BCE – d. after 15 BCE), probably written around 15 BCE

The chronology agreed upon by modern philologists (such as Pierre Gros and Louis Callebat) places the birth of Marcus Vitruvius Pollio around 80–70 BCE and his death around 15 BCE. His magnum opus, De architectura, was written progressively and dedicated to Octavian Augustus between 27 BCE and 23 BCE (coinciding with the consolidation of the Principate and the great urban renewal program of Rome), although some technical appendices could be revised until 15 BCE.

" The treatise De architectura, the only theoretical corpus of Greco-Roman architecture preserved in its entirety, was composed by the engineer and military architect Marcus Vitruvius Pollio (c. 80/70 BCE – 15 BCE). The internal chronology of the text places its main phase of writing between 27 BCE and 23 BCE, a critical period in the history of the West marked by the transition from the Roman Republic to the Principate of Octavian Augustus."

Vitruvius conceived his ten books not as a descriptive manual a posteriori, but as a programmatic and legitimizing manifesto of the new political order. By dedicating the work to the Imperator, the author aligned geometric science and construction techniques with the official program of the Restitutio Reipublicae. The treatise served as the conceptual framework for the

monumentalization of public space, providing Augustus with the architectural tools necessary to fulfill his celebrated historiographical maxim: to have received a Rome built of brick (latericia) and to bequeath to posterity a metropolis clad in marble (marmorea). The dating of the work, fixed in its definitive edition around 15 BCE, closes the era of Hellenistic influence on the Italian peninsula and inaugurates the construction canon of the global Empire.

Critical Notes

1. **The significance of 27 BCE: In this year, Octavian received the sacred title of Augustus from the Senate. This is the precise moment when Vitruvius decided to present him with the treatise. This is not a chronological coincidence: Vitruvius knew that a new Empire needed a new architecture that reflected stability, order, and eternity (firmitas). It should be emphasized that the ten books constitute the geometric constitution of Augustus's Empire.**

2. **The Pax Romana as a technical requirement: Vitruvius** confesses in the Proem of Book I that, while the Roman state was mired in civil wars (against Julius Caesar, Mark Antony, and Pompey), he dedicated himself to artillery and legionary ballistics. Only when Augustus pacified the world (*Pax Romana*) could the architect withdraw the siege engines and devote himself to theorizing about temples and forums. The order of sacred space was only possible when the chaos of war ceased.

3. **The transition from the papyrus scroll (volumina) to the modern book: around 15 BCE, Vitruvius presented Augustus with ten separate papyrus scrolls (volumina). The concept of a single bound book is a late antique and medieval development. This physical separation explains why each book has its own independent preface (proemium): each scroll was opened and read before the emperor as a separate discursive and scientific unit.**

Editing Criteria and Translation Note

The Latin passages in this edition are checked against Fritz Krohn's Vitruvii de architectura libri decem (Leipzig: B. G. Teubner, 1912). Rose (1899), the Budé volumes and modern translations provide further points of comparison where specifically cited. This procedure must be distinguished from a new collation of the manuscripts: a reading attributed to a manuscript requires an identifiable

witness and a verifiable source in a critical apparatus or a documented inspection of the relevant folio.

Morgan's The Ten Books on Architecture (1914) and the translation by Ingrid D. Rowland, with commentary and illustrations by Thomas Noble Howe (1999), provide two important twentieth-century points of comparison. Their interpretations are consulted where relevant to a technical or historical problem; neither replaces the author's Spanish translation as the source of the English. A reference to these works should not be taken as certification that every passage has been newly collated against them.

Contemporary Spanish Reception: The ERT Edition (1970)

Likewise, for the study of the historiographical fortune of the treatise in the Hispanic context of the 20th century, the singular and monumental bibliophilic edition of *De architectura* published in Madrid by Ediciones de Arte y Bibliofilia for the corporation **Unión Explosivos Río Tinto, SA has been compared.** This work has a prologue of a humanistic nature by Eugenio Montes, member of the Royal Spanish Academy, and presents a careful vernacular translation made by the philologist and professor of the Complutense University, Carmen Andreu.

Technical revision, which was entrusted to Dr. **Fernando Higueras**, an architect who was then in charge of the real estate division of the aforementioned company. Higueras's intervention in Vitruvius's text represents a milestone of considerable interest for contemporary architectural theory: a master of structural organicism and expressive structuralism of the 1970s reinterpreting the geometric rigor of the 1st century BC. This edition not only functioned as a collector's item, but also as a hermeneutical bridge where classical prescriptions regarding the hygienic environment, materials, and modular *symmetry* were reread through the lens of the 20th-century architectural avant-garde.

Methodological notes

1. Krohn's contribution (1912). His Teubner edition offers an important critical constitution of Vitruvius's text and an apparatus that distinguishes transmitted readings from editorial interventions. It should be consulted alongside Rose and the relevant Budé volume. No edition restores an unmediated "pure" manuscript text: readings must be assessed at individual

passages, and the relations among H, S, E and G require the distinctions set out in Krohn's preface.

2. **The Rowland-Morgan duality: the collation of Morgan (1914) with Rowland (1999) covers the entire hermeneutical arc of the twentieth century. Morgan reflects the rigid, engineering reading of the nineteenth century; Rowland integrates the discoveries of late-twentieth-century construction archaeology (the findings at Pompeii, Herculaneum, and the forums). The result is a balance between statics and material history.**

3. **Fernando Higueras and the modern reception: the technical revision of the Vitruvian edition entrusted to the architect Fernando Higueras is a point of interest for the twentieth-century Hispanic reception of the treatise. Known for his reinforced-concrete structures of complex geometry and organic imbrication (such as the Crown of Thorns in Madrid), Higueras illustrates the continued relevance of the principles of *firmitas* and modular *venustas* in modern architecture, which returned to the discipline of the Vitruvian module and the analemma in contemporary design.**

To definitively close the history of the transmission of De *architectura, we delve into the 17th and* 18th centuries, the golden age of enlightened codification and the academic institutionalization of the classical canon.

These two references represent the two monumental milestones of translation and critical editing in the Modern Age: the French edition by Claude Perrault (1673/1684), which represented a scientific revolution by applying Cartesian rationalist physics to the Roman text, and the Spanish edition by José Ortiz y Sanz (1787), printed by the Royal Printing House, which constitutes the pinnacle of the Hispanic Enlightenment and the birth of scientific archaeology in Spain.

Critical apparatus:

Restitution and academic writing (The Enlightened and Academic Reception)

"The process of exegesis and visual fixation of the Vitruvian treatise reached its critical and institutional maturity during the centuries of the Enlightenment

and European rationalism, periods marked by two publishing ventures of universal significance:

• **Claude Perrault's rationalist recension (1673/1684):** Published under the title Les *dix livres d'architecture de Vitruve, corrigez et traduits en françois*, the work of the physician, scientist, and architect Claude Perrault transformed the foundations of the discipline. Perrault applied the Cartesian method and the rigor of the *Académie des Sciences* to the Latin text. His fundamental contribution lay in the demystification of the mystical character of classical proportions; the French scholar argued that beauty (*venustas*) did not respond to divine or immutable laws of nature, but to a cultural and arbitrary pact of architects (the invention of taste). His sumptuous array of engravings not only illustrated the elusive lost *figures*, but also served to legitimize the design of the Louvre colonnade, establishing the canon of French Classicism.

• **The pinnacle of the Hispanic Enlightenment: José Ortiz y Sanz (1787):** Following the partial attempts of the preceding century, the priest and Enlightenment thinker Joseph Ortiz y Sanz completed the monumental translation: *The Ten Books of Architectura by Marcus Vitruvius Pollio, translated from the Latin and annotated*. Printed in Madrid by the prestigious Royal Printing House in an imposing *folio format of 42.5 cm, this work marked Spain's entry into modern architectural philology. Ortiz y Sanz did not limit himself* to translating; he collated the Vatican codices by hand, corrected the errors accumulated by the Italian translators, and endowed the volume of 56 copperplate engravings with millimeter - level archaeological precision. Sponsored directly by the Bourbon reforms of Charles III and Charles IV, this edition served as the obligatory reference text for the Royal Academy of Fine Arts of San Fernando, eradicating the decorative excesses of the late Baroque and establishing the rigor of Neoclassicism on Iberian soil.

Official Bibliographic Catalog, these references must be indexed under the standard of American archival and philological rigor (**APA 7th edition**):

Vitruve. (1684). Vitruve's architectural books, corrected and translated in French, with notes and figures (C. Perrault, Trans.; 2nd ed. rev. and augm.). Paris: Jean Baptiste Coignard. [Original edition of 1673].

Vitruvius Pollio, M. The Ten Books of Architecture by Marcus Vitruvius, 1787.
Pollion (J. Ortiz y Sanz, Trans. and Com.). Madrid: Royal Printing Press. (In-folio, XXVIII, 277 pp., LVI plates).
Exegetical notes

1. **Claude Perrault's theoretical fracture: this point is crucial for assessing the persistence of a sacred geometry or cosmic order. Perrault opens a wound in the history of architecture: he argues that the golden ratio and the homo bene figuratus are not divine truths. For Perrault, the eyes become accustomed to seeing buildings in a certain way, and that is why they seem beautiful to us, not because they reflect the order of heaven (Book IX). Perrault thus marks the shift from architecture as mysticism and cosmology to architecture as an engineering science and cultural convention.**

2. **The Royal Printing Press and the Political Control of Order: The Ortiz y Sanz edition (1787) was not a literary whim. The enlightened Spanish state needed to standardize architecture to control its territory (just as Augustus did in 15 BCE). By decreeing that all churches, town halls, and hospitals in the Spanish Empire (including Spanish America) had to follow the 56 plates of Ortiz y Sanz, the Crown used Vitruvian principles to visually standardize the urban landscape and bury the Churrigueresque style. Geometry once again became an instrument of political sovereignty and the ordering of matter.**

3. **The value of the 56 plates by Ortiz and Sanz:** Unlike the Renaissance illustrations of Cesare Cesariano or Palladio (who adapted Vitruvius to their own architectural tastes), the plates by Ortiz and Sanz are characterized by obsessive philological rigor. The Spanish Enlightenment thinker measured ancient monuments, striving to understand the precise mathematics of the texts without adding Baroque or modern embellishments. They represent the birth of modern archaeological technical drawing in the Hispanic world.

Regarding the name of the treatise:
For the palaeographical and philological assessment, particular attention must be given to Harley MS 2767 (H), held by the British Library. The manuscript,

copied in Caroline minuscule in the first quarter of the ninth century, is the oldest known surviving witness to Vitruvius's De architectura. The British Library catalogs Cologne or Aachen as possible places of origin, and an association with Charlemagne's palace scriptorium remains conjectural.

Medieval manuscripts identify works through opening and closing formulas, conventionally called incipit and explicit, as well as through rubrics. These forms belong to the history of transmission and must be distinguished from the title pages of printed editions.

The British Library's catalogue records the opening of Harley MS 2767 as follows:

1. The opening formula

The cataloged text begins with the title of Book I and the dedication to Caesar. The catalogue gives the incipit as:

"Vitruvii de Architectura liber I. Cum divina tua mens et numen, Imperator Caesar."

This report attests the medieval transmission of the title De architectura. Its capitalization and punctuation here follow the catalogue rather than a fresh diplomatic transcription of the folio.

The closing formula and the ten-book structure

The British Library records De architectura on ff. 1r–162v, followed by a recipe added after the explicit. The ten-book structure is also established internally by Vitruvius's prefaces and cross-references. Book X ends with accounts of siege defense, rather than a chapter devoted solely to torsion engines.

For the witness's contents and physical description, see the British Library catalogue, Harley MS 2767. The incipit and explicit are documentary formulas whose precise spelling should be cited from the relevant folio or from an explicitly identified catalogue report.

Philological implications for the interpretative framework of this edition

- **The author's name. Marcus Vitruvius Pollio is the conventional modern form. Individual witnesses, rubrics and printed editions differ in the way they name the author, and the presence or absence of a praenomen must be checked in the relevant locus. A catalog's modern author heading should not be mistaken for a diplomatic transcription of**

a manuscript rubric. This edition retains the familiar name without presenting its full form as independently established from every early witness.

- The ten-book structure. Medieval rubrics preserve the work's division into books, while the text itself repeatedly marks its sequence and recalls earlier discussions. The reading of this tenfold structure as an architectural organism belongs to the interpretive argument of the present study.

Praefatio Editoris

Lectori docto, salutem.

Opus Marci Vitruvii Pollionis, De architectura, quod non modo antiquae constructionis rationes, sed etiam universam artium liberalium disciplinam complectitur, diu sub umbra translationum vitiosarum delituit. In hac editione nostra, quae anno bis millesimo vicesimo sexto in lucem profertur, propositum nostrum fuit textum ex editionibus criticis receptum diligenter exponere, lectiones incertas indicare et rationes architectonicas studiosis explanare.

Non ignoramus, in hoc vetusto opere, multos locos ob linguam technicam, quae Graecis vocabulis abundat, difficiles esse intellectu. At vero, cum machinae nostrae aetatis *echeia* pro *echo* vel *chorobaten* pro *saltatore* vertissent, philologiae officium erat verum sensum mechanicum et geometricum restituere. Non est enim vitruvianus textus ad voluptatem legentis scriptus, sed ad aedificandum et ad machinas movendas; unde oportet verba eius tamquam instrumenta ipsa — sicut perpendiculum, regulam, aut circinum — percipi.

In apparatu critico, qui in fine voluminis stat, rationem reddimus emendationum nostrarum, errores quosdam anachronismosque, qui in editionibus vulgaribus pervulgati sunt, aperte demonstrantes. Speramus igitur hanc nostram operam — *Sophia Lux Publishing* auspice edita — non modo architectis et ingeniariis, sed etiam philologis et historiae cultoribus, tamquam firmum fundamentum ad opus vitruvianum intellegendum inservituram esse.

Bene vale.

Datum Bonaeropoli, A.D. MMXXVI.

Praefatio editoris · Editorial principles

This section sets out, for the benefit of the scholarly reader, the nature of the present edition, the text that underlies it, the scope of its critical apparatus, and the orthographic and translational conventions adopted throughout.

Nature and base text

This is a *bilingual reading edition with a selective critical apparatus*. The authorial Spanish translation by Diego Kurilo is the source of the English translation. Its Latin base is Fritz Krohn's edition (Leipzig: Teubner, 1912), checked against Valentin Rose (Leipzig: Teubner, 1899); the Budé volumes provide further critical and architectural reference by book. A printed or electronic edition is distinguished from a direct reading of an individual m*anuscript*. Where the text departs from the adopted edition, or where a reading remains disputed, the difference must be identified in the apparatus.

Scope of the apparatus

The critical apparatus of this edition is *selective and illustrative* rather than exhaustive. It does not record every variant of every witness lemma by lemma, as the great systematic editions (Teubner, Budé) do; instead it concentrates on the passages of decisive importance for the constitution, the dating or the interpretation of the text, which are treated in the *Apparatus criticus* (Appendix M) and in the analytical restitution of the Greek vocabulary (Appendix N). The reader who requires a full positive apparatus is referred to the editions of Rose, Krohn and the Collection Budé. This limitation is stated openly so that the edition may be judged for what it is: a critical reading edition addressed to the architect and the historian of architecture, uniting the philological apparatus with the technical and architectural analysis.

Orthographic conventions

In the running Latin text the consonantal *u*/*v* is normalized in the modern manner (*utilitas*, *Vitruvius*), the classical majuscule *V* being retained only in display titles and rubrics that reproduce the epigraphic and manuscript usage (*DE ARCHITECTVRA*). The diphthong *ae* is written in full; consonantal *i* is not distinguished as *j*. Greek words are given in their restored polytonic form,

with the correct breathings and accents, accompanied where useful by a Latin transliteration; the principles of restitution are set out in Appendix N.

Translation

The English translation derives from Diego Kurilo's original Spanish translation, itself made directly from Latin. Its governing aim is fidelity to that authorial interpretation, with Latin used to check doubtful technical terms, concepts and numbers. Granger and Rowland–Howe are comparative references rather than replacement source translations. Technical terms without exact modern equivalents—*firmitas*, *utilitas*, *venustas*, *symmetria*, *ordinatio* and *dispositio*—are retained in Latin where necessary and defined in the Glossary (Appendix A).

Conspectus siglorum

The following sigla denote the principal manuscript witnesses and editions cited in the apparatus. The relations among the manuscripts are set out in the *Stemma codicum* (Appendix M).

Manuscripts

H Harleianus 2767 (London, British Library, Harley MS 2767), first quarter of the ninth century (800–824). The British Library identifies it as the oldest known surviving copy of De architectura. Its possible origin in Cologne or Aachen, and possible association with Charlemagne's palace scriptorium, are catalogued as uncertain.

Cotton Cotton MS Cleopatra D I, ff. 1–82 (London, British Library), first half of the eleventh century (1000–1049). The Vitruvian preface is on f. 2v and the ten books on ff. 3r–82r. This is a distinct witness from Harley MS 2767; no reading of one is attributed to the other. The catalog identifies the codex and its contents, but does not replace inspection of the relevant folio or a verifiable critical apparatus.

G Gudianus 69 (Wolfenbüttel, Herzog August Bibliothek), eleventh century. Krohn, preface VIII, groups G with E on the side of the tradition distinct from H and S; he does not describe G simply as a descendant of H.

E Gudianus 132, tenth century, with Vitruvian excerpts interspersed among chapters of Faventinus; S Selestadiensis, tenth century. These are Krohn's sigla (1912, preface VIII). A siglum's meaning must be checked anew when another edition is cited.

L (Rose) Leiden, Universiteitsbibliotheek, Voss. lat. F. 88, dated to the tenth century in Rose's sigla list (1899, IX).

P / p (Rose) P denotes the Pithoeanus, Paris, Bibliothèque nationale de France, Latin 10277; p denotes Latin 7227. Rose dates P to the early tenth century and p to the eleventh or twelfth (1899, IX). Case distinguishes the two sigla.

recent. recentiores: later witnesses, whose individual relationships depend on the critical edition cited.

Ω the lost common archetype inferred from shared textual disturbance. The symbol denotes a reconstructed exemplar, not a surviving codex with an independently established date.

Editions

Rose Valentin Rose, ed., *Vitruvii de architectura libri decem*. Leipzig: B. G. Teubner, 1899. Comparative edition.

Krohn Fritz Krohn, ed., *Vitruvii de architectura libri decem*. Leipzig: B. G. Teubner, 1912. Adopted Latin base.

Granger F. Granger, ed. and trans., *Vitruvius: On Architecture*. 2 vols. Loeb, 1931–34.

Rowland–Howe I. D. Rowland, trans., and T. N. Howe, ed., *Vitruvius: Ten Books on Architecture*. Cambridge, 1999.

Budé Collection des Universités de France, *Vitruve: De l'architecture* (Les Belles Lettres, by book).

Editorial symbols

] closes the lemma; the readings of the witnesses follow.

om. *omittit / omittunt*: the witness omits the word(s).

deest the passage is wanting in the witness.

add. *addit*: the witness adds.

corr. *correxit*: corrected by a later hand or editor.

[ ] editorial signs of seclusion: material regarded by the cited editor as doubtful or to be excluded. Their precise force must be established from that edition; brackets do not by themselves prove a later interpolation.

⟨ ⟩ an editorial supplement to the transmitted text.

coni. *coniecit*: conjectured by (a named scholar).

rest. *restituit*: restored by; *rest. ex* = restored from (a parallel source).

recent. *recentiores*: the more recent witnesses or editions.

BILINGUAL EDITION: DE ARCHITECTVRA

Sources of the comparative apparatus. The comparative and explanatory notes are grounded in Diego Kurilo's authorial Spanish translation. References there to Budé retain their authorial provenance; they do not, by themselves, certify a new complete collation of Budé's apparatus. Particular corrections checked against the printed editions of Krohn (1912) and Rose (1899) identify the edition and page. Reported manuscript readings are distinguished from direct inspection of a manuscript, and no reading of Cotton Cleopatra D I is inferred from Harley MS 2767 or from a collective siglum.

M. VITRVVIVS POLLIO · DE ARCHITECTVRA · LIBER I

Argumentum Libri I — After the *dedicatory proem to Augustus, Vitruvius defines the encyclopedic training of the architect and the six fundamental principles of the discipline (ordinatio, dispositio, eurythmia, symmetria, decor, distributio); he explains the parts of architecture, the choice of healthy sites, the layout of walls and towers, the orientation of streets according to the compass rose and the arrangement of public buildings.*

Note. *— Book I establishes the architect's education and professional competence, sets out the six categories of I.2.1 (ordinatio, dispositio, eurythmia, symmetria, decor and distributio), formulates the triad firmitas–utilitas–venustas in I.3.2, and then develops questions of health, fortification, winds and urban planning. Its importance for subsequent architectural theory is exceptional, but its categories must be read within their ancient technical and linguistic context.*

[I.praef.1] *Cum divina tua mens et numen, imperator Caesar, imperio potiretur orbis terrarum invictaque virtute cunctis hostibus stratis, triumpho victoriaque tua cives gloriarentur et gentes omnes subactae tuum spectarent nutum populusque Romanus et senatus liberatus timore amplissimis tuis cogitationibus consiliisque gubernaretur, non audebam, tantis occupationibus, de architectura scripta et magnis cogitationibus explicata edere, metuens ne non apto tempore interpellans subirem tui animi offensionem.*

Academic translation

" While your divine mind and inspiration, Emperor Caesar, held dominion over the world, and, once all enemies had been vanquished by your invincible valour, the citizens rejoiced in your triumph and victory, all subjugated nations awaited your signal, and the Roman people and the Senate, freed from fear, were guided by your profound reflections and counsel, I dared not, amidst such lofty occupations, publish my writings on architecture, composed after extensive meditations, fearing that, by interrupting you at an inopportune moment, I might incur your displeasure. "

Textual note on the preface to Book I

Adopted text: “Cum divina tua mens et numen, imperator Caesar, imperio potiretur orbis terrarum … et gentes omnes subactae tuum spectarent nutum populusque Romanus et senatus …”. This wording agrees with the reference text of Krohn (1912) and with the editions of Rose (1899) and Budé (Fleury, 1990). This reading edition does not reproduce manuscript variants that have not been checked directly in an identifiable critical apparatus.

Editorial principle. Indications such as “codd. plerique”, “nonnulli”, “aliquot dett.” or “Rose (ed. alt.)” are cited only where the witness, edition and passage can be identified securely.

- **Divina tua mens et numen]** Adopted wording. The expression emphasizes the elevated, almost divine status accorded to Augustus. The earlier reference to “codd. plerique” and unspecified old editions is not treated as documentary evidence.
- **imperio potiretur]** Adopted reading. It means “he exercised dominion / possessed the empire”.
- **orbis terrarum]** Adopted reading. It is equivalent to “the whole world” or “the terrestrial orb”.
- **invictaque virtute]** Adopted reading. Virtus here has the Roman sense of “military valour ” and “excellence”.
- **cunctis hostibus stratis]** Stratis means ‘laid low’, ‘prostrated’ or ‘defeated’ in this context.
- **Triumpho victoriaque tua]** The adopted wording links the emperor’s triumph and victory. An additional et has no identified documentary witness in the sources cited here and is not adopted as a manuscript variant.
- **tuum spectarent nutum]** Preferred reading. A nod (nutus) denotes a sign, an assent, or the sovereign will — a nod of the ruler’s head.
- **amplissimis tuis cogitationibus consiliisque]** A formula of elevated praise: ‘your far-reaching reflections and counsel’.
- **non audebam … edere]** Edere here means to publish or make a written work public.
- **metuens ne non apto tempore interpellans subirem tui animi offensionem]** Standard reading. It means “afraid of incurring your displeasure by interrupting you at an inopportune moment.”

The meaning of the Text (*Academic Analysis*)

In this first paragraph of the preface, Vitruvius uses an extremely elaborate Latin period (a typical construction of rhetorical prose) to address Augustus with great reverence.

The fundamental meaning is as follows:

Vitruvius justifies the delay in publishing his work De architectura. He explains that, while Augustus was at the height of his power — having pacified the Roman world after the civil wars — he did not dare to distract him with his writings on architecture.

The author uses language laden with courtly flattery (typical of Augustan literature):

- He describes Augustus's mind as *divine* and mentions his *numen* (divine force).
- His *undefeated military virtus stands out*.
- It presents the emperor as absolute ruler of the world (*imperio potiretur orbis terrarum*).
- He describes how the Roman people and the Senate, freed from fear, are guided by Augustus's judgment.

With this rich rhetoric, Vitruvius achieves two objectives:

1. Demonstrate humility and respect before the *princeps*.
2. Carefully choosing the moment to dedicate his work: precisely when Augustus has achieved universal peace and can dedicate himself to cultural and construction projects.

This introduction sets the tone for the entire treatise: a technical work presented under imperial protection and seeking to contribute to Augustus's program of architectural and cultural renewal.

M. Vitruvii Pollionis
De architectura
Liber I, Praefatio 2

Cum vero attenderem te non solum de vita communi omnium curam publicaeque rei constitutione habere, sed etiam de opportunitate publicorum aedificiorum, ut civitas per te non solum provinciis esset aucta, verum etiam ut maiestas imperii publicorum aedificiorum egregias haberet auctoritates, non putavi praetermittendum quin primo quoque tempore de his rebus ea tibi ederem,

ideo quod primum parenti tuo de eo fueram notus et eius virtutis studiosus. Cum autem concilium caelestium in sedibus inmortalitatis eum dedicavisset et imperium parentis in tuam potestatem transtulisset, idem studium meum in eius memoria permanens in te contulit favorem. Itaque cum M. Aurelio et P. Minidio et Gn. Cornelio ad apparationem ballistarum et scorpionum reliquorumque tormentorum refectionem fui praesto et cum eis commoda accepi, quae cum primo mihi tribuisti, recognitionem per sororis commendationem servasti.

But when I observed that you were not only concerned with the common life of all and with the ordering of the commonwealth, but also with the fitness of public buildings—so that the State was enlarged not only by your provinces, but also that the majesty of the empire might possess the eminent authority of its public buildings—I did not think it right to omit laying these matters before you at the earliest opportunity, the more so because I had first been known to your father and was an admirer of his virtue. But when the council of the heavenly powers had consecrated him among the seats of immortality and had transferred your father's empire into your power, that same devotion of mine, abiding in his memory, transferred my allegiance to you. And so, together with Marcus Aurelius, Publius Minidius and Gnaeus Cornelius, I was at hand for the preparation of ballistae and scorpiones and the repair of the other engines of war, and with them I received my emoluments, which, once you had first granted them to me, you continued to me by your sister's recommendation.

Critical Apparatus

- **de vita communi omnium curam]** Adopted reading. It means "the general welfare of all".
- **publicaeque rei constitutione]** It refers to the "organization of the State" or "constitution of the republic".
- **de opportunitate publicorum aedificiorum]** Opportunitas = suitability, convenience, good location.
- **maiestas imperii]** Key expression of the Augustan ideology: "the majesty of the Empire".
- **egregias haberet auctoritates]** It means "he enjoyed eminent authority" or "exceptional prestige".
- **parenti tuo]** Reference to Julius Caesar (Augustus's adoptive father).

- **concilium caelestium in sedibus immortalitatis eum dedicavisset]** It alludes to the apotheosis (divinization) of Julius Caesar.
- **imperium parentis in tuam potestatem transtulisset]** Formal expression of the transmission of power.
- **M. Aurelio et P. Minidio et Cn. Cornelio]** Names of military engineer colleagues. Cn. and Gn. are alternative abbreviations of Gnaeus; the text here prints Cn.
- **ad apparationem ballistarum et scorpionum]** Apparationem = preparation, construction.
- **recognitionem per sororis commendationem servasti]** Adopted reading. Recognitionem = gratification, economic reward; sororis refers to Octavia, sister of Augustus.

Academic translation

"But when I observed that you were concerned not only with the common welfare of all and the organization of the state, but also with the proper arrangement of public buildings — so that, thanks to you, the city had not only grown larger through the annexation of provinces, but also that the majesty of the Empire had the exalted authority of its public buildings — I considered that I should not delay any longer in dedicating these writings to you on such matters at the first opportunity. This is because, in the first place, I was known to your father precisely for this reason and was devoted to his virtue. Now, when the council of the gods consecrated him in the abodes of immortality and transferred your father's power to your authority, my own loyalty, which remained alive in his memory, transferred its favor to you." Therefore, I served, along with Marcus Aurelius, Publius Minidius, and Gnaeus Cornelius, in the preparation of ballistae, scorpions, and the repair of other war machines, and I received the corresponding emoluments along with them. These rewards, which you initially granted me, you subsequently maintained on the recommendation of your sister.

Explanation of the Meaning of the Text (Academic Analysis)

In this second paragraph of the preface, Vitruvius explains the reasons that prompted him to dedicate his work to Augustus.

The text develops two main ideas:

1. **Thematic justification**: Augustus not only concerns himself with military and political matters, but also with urban beautification and architectural monumentality. Vitruvius thus links his treatise to Augustus's political and propagandistic program, centered on the *maiestas imperii* through public works.

2. **Personal justification**: Vitruvius reveals his career path. He appears to have served as a military engineer in the time of Julius Caesar (parenti *tuo*), worked alongside three colleagues in the manufacture and repair of artillery (*ballistae*, *scorpiones* and *tormenta*), and received rewards that Augustus maintained even after Caesar's death, thanks to the recommendation of Octavia (Augustus' sister).

Latin text
M. Vitruvii Pollionis
De architectura
Liber I, Praefatio 3

Cum ergo eo beneficio essem obligatus, ut ad exitum vitae non haberem inopiae timorem, haec tibi scribere coepi, quod animadverti multa te aedificavisse et nunc aedificare, reliquo quoque tempore et publicorum et privatorum aedificiorum, pro amplitudine rerum gestarum ut posteris memoriae traderentur, curam habiturum. Conscripsi praescriptiones terminatas, ut eas attendens et ante facta et futura qualia sint opera per te posses nota habere; namque his voluminibus aperui omnes disciplinae rationes.

Since this favor bound me to you and freed me from the fear of poverty for the rest of my life, I began to write these books for you. I had observed that you had built many works and were still building, and that you would continue to care for public and private buildings on a scale commensurate with your achievements, so that they might be handed down to posterity. I have set down precise rules so that, by attending to them, you may judge for yourself the quality of works already completed and of those yet to come; for in these volumes I have explained all the principles of the discipline.

Critical Apparatus

- **eo beneficio essem obligatus]** It refers to the rewards and the financial support received from Augustus.

- **ad exitum vitae non haberem inopiae timorem]** An elegant expression that means "not having to fear poverty until the end of my days".
- **multa te aedificavisse et nunc aedificare]** It indicates both completed works and those under construction.
- **pro amplitudine rerum gestarum]** It alludes directly to the greatness of Augustus' feats (Res Gestae).
- **posteris memoriae tradantur]** It means "to be transmitted to posterity as a (lasting) memory".
- **Conscripsi praescriptiones terminatas]** Praescriptiones terminatas = "precise instructions" or "well-defined rules" (referring to the ten books of the treatise).
- **et ante facta et futura]** Vitruvius offers tools to evaluate both works already completed and those that will be built in the future.

Academic translation

"Being bound, therefore, by that favor of yours, so that until the end of my life I need not fear want, I began to write these books for you because I noticed that you had built many works and that at this moment you were still building, and that in the future you would also take care of both public and private buildings, ensuring they matched the greatness of your achievements, so that they might be passed on to posterity as your memory. I have written precise and well-defined prescriptions so that, by paying attention to them, you may clearly know, both the works already completed and those to come, what qualities the buildings constructed under your direction should have; for in these volumes I have explained all the principles of the discipline."

Explanation of the Meaning of the Text (Academic Analysis)

In this paragraph Vitruvius concludes the autobiographical and justificatory part of the preface and presents the practical purpose of his work.

Main points:

- He expresses gratitude for Augustus's financial support, which has freed him from the fear of poverty for the rest of his life.
- He directly links his treatise to Augustus's intense building program (both present and future).

- *De architectura* offers as a useful technical manual for the emperor: a guide that will allow him to evaluate the quality of the works already built and supervise those that will be carried out in the future.
- It reinforces the idea of architecture as a vehicle for imperial *memory*, that is, as a means for the greatness of Augustus to endure before posterity.

This paragraph marks the transition between the personal dedication and the beginning of the technical content of the treatise.

M. Vitruvii Pollionis
De architectura
Book I, Chapter 1.1
Chapter 1

Comparative apparatus — I.1.1. "Architecti est scientia..." is the lemma under discussion. Scientia is translated as "knowledge" or "disciplinary knowledge" wherever "science" might suggest a modern institution. Fabrica and ratiocinatio are not isolated theory and practice, but two dimensions whose conjunction defines the competence of the architectus.

Architecti est scientia pluribus disciplinis et variis eruditionibus ornata, cuius iudicio probantur omnia[106] *quae ab ceteris artibus perficiuntur opera. Ea nascitur ex fabrica et ratiocinatione. Fabrica est continuata ac trita usus meditatio, quae manibus perficit[ur] e materia cuiuscumque generis opus [est] ad propositum deformationis. Ratiocinatio autem est, quae res fabricatas sollertiae ac rationis pro portione demonstrare atque explicare potest.*

The architect's knowledge embraces many disciplines and varied forms of learning; by its judgment, all works accomplished by the other arts are assessed. It arises from fabrica and ratiocinatio. Fabrica is the continuous, practised exercise of making: through manual work and materials of whatever kind, it brings a work into being according to its intended design. Ratiocinatio, by contrast, enables one to demonstrate and explain constructed works according to the proper proportion of skill and reason.

COMPARATIVE CRITICAL NOTE — I.1.1. The manuscript tradition and modern editions do not agree on every detail of this definition. This edition retains cuius iudicio probantur omnia, a transmitted reading also adopted in the modern critical text consulted; Granger, by contrast, regarded the clause as a possible interpolation and proposed different punctuation. For fabrica, the readings perficit[ur] and opus [est] retain editorial brackets. The concluding phrase is given as sollertiae ac rationis

106 cuius iudicio probantur omnia] A disputed passage in the editorial tradition. Krohn (1912) prints these words in the text; other editions have marked them as doubtful or enclosed them in brackets. This edition retains them, but records the discussion without attributing a deletion to the manuscript tradition where the apparatus for the passage has not been verified.

pro portione, rather than the smoother normalization sollertia ratione proportionis. These distinctions separate transmitted readings, editorial conjecture and syntactic regularization.

Exegetical note — Fabrica and ratiocinatio. The distinction does not set manual skill and intellect apart as sealed compartments. Vitruvius presents two inseparable dimensions of the profession: experience in execution and the ability to justify rationally what has been built. Scientia here means the disciplinary knowledge of the architectus, not "science" in its modern institutional sense.

Critical Apparatus

- **Architecti est scientia]** Adopted reading. The genitive architecti indicates "the science proper to the architect" or "the knowledge of the architect", not "the architect is a science".
- **pluribus disciplinis et variis eruditionibus ornata]** Standard reading. Ornata = enriched, decorated.
- **cuius iudicio probantur omnia]** This edition retains the transmitted phrase. Granger questioned its authenticity and proposed treating the passage differently; the manuscript evidence should not be described as unanimous without reference to a critical apparatus.
- **Ab ceteris artibus]** "By the other arts". This is the adopted phrase. The alternative ex ceteris lacks an identified witness in the sources cited here and is not assigned to a manuscript.
- **continuata ac trita usus meditatio]** Preferred reading. Trita = worn by use, exercised, habitual.
- **ad propositum deformationis]** Adopted reading. Deformatio = design, layout, projected form.
- **sollertiae ac rationis pro portione]** Adopted in the Spanish source edition; the alternative sollertia ratione proportionis is an editorial normalization. The distinction is textual, not merely typographical.

Academic translation

"The architect's knowledge is enriched by many disciplines and varied forms of learning; by its judgment all works carried out by the other arts are assessed. It arises from building practice (*fabrica*) and theoretical reasoning (*ratiocinatio*)."

practice is the continuous meditation exercised by use, through which the work is carried out with the hands, from any type of material, according to the projected design.

Theoretical reasoning, on the other hand, is that which can demonstrate and explain, with technical skill, through method and proportion, works that have already been built.

Explanation of the Meaning of the Text (Academic Analysis)
This is one of the most important and frequently cited paragraphs in all of Vitruvius's work. In it, he establishes the **dual nature of architecture**:

- **Fabrica → The practical and manual dimension of the architect's work: construction informed by accumulated experience.**
- **Ratiocinatio** → Theoretical, intellectual aspect: the ability to explain, justify and project works through reason, mathematics and proportion.

From the outset, Vitruvius argues that architecture is not merely a trade, but a scientia (an intellectual discipline) requiring encyclopedic training. The architect must possess profound knowledge in multiple fields (which will be detailed later), as their judgment serves as the supreme criterion for validating the works of other arts.

Key concepts:

- Architecture as a synthesis between *praxis* and *theoria*.
- The importance of the *proportio* (proportion) as a rational principle.
- The architect as an intellectual figure and not just as a builder.

This paragraph lays the theoretical foundations of the entire treatise and exerted an enormous influence on Renaissance architectural theory (Alberti, Palladio, etc.).

M. Vitruvii Pollionis
De architectura
Book I, Chapter 1.2

Itaque architecti, qui sine litteris contenderant ut manibus essent exercitati, non potuerunt efficere ut haberent pro laboribus auctoritatem; qui autem ratiocinationibus et litteris solis confisi fuerunt, umbram non rem persecuti videntur. At qui utrumque perdidicerunt, uti omnibus armis ornati, citius cum auctoritate quod fuit propositum sunt adsecuti.

Therefore, architects who sought to train their hands without acquiring literary learning could not gain recognition commensurate with their labors; those who relied on reasoning and books alone seem to have pursued the shadow rather than the substance. Those, however, who thoroughly mastered both, equipped as though with every weapon, attained their aims more swiftly and with authority.

Critical Apparatus

- **sine litteris contenderant]** Adopted reading. Litterae = theoretical studies, literary and scientific culture.
- **ut manibus essent exercitati]** Refers to exclusively practical and manual training.
- **pro laboribus auctoritatem]** Means "authority or professional standing commensurate with their efforts".
- **umbram non rem persecuti]** Platonic metaphor: they pursued the "shadow" (appearance) and not the "reality" (rem).
- **uti omnibus armis ornati]** Comparison of the complete architect with a fully armed soldier (very Roman image).
- **citius cum auctoritate]** Emphasizes that those who master both forms of training achieve their aims more quickly and with greater authority.

Academic translation

" Therefore, those architects who strove to practice solely with their hands, without the support of letters, could not achieve an authority commensurate with their efforts. On the other hand, those who relied only on theoretical reasoning and letters seem to have pursued a shadow and not reality itself. But those who thoroughly mastered both disciplines, like soldiers equipped with all weapons, achieved their goal more quickly and with greater authority. "

Explanation of the Meaning of the Text (Academic Analysis)

In this paragraph, Vitruvius develops and exemplifies the thesis presented in the previous section. He establishes a clear typology of architects and defends an intermediate position:

1. **Purely practical architects** (*sine litteris*): They have great manual dexterity, but lack intellectual authority and social prestige.
2. **theoretical architects** (*rationationibus et litteris solis*): They possess speculative knowledge, but their proposals lack real foundation. Vitruvius

criticizes them with the Platonic metaphor of the "shadow" versus the "reality ".

3. **Ideal architects** (*qui utrumque perdidicerunt*): Those who combine practice (*fabrica*) and theory (*ratiocinatio*). These are the only ones who achieve complete success, described with a very eloquent military image: "like soldiers equipped with all weapons."

Importance of the paragraph:

- It reinforces the Vitruvian ideal of the architect as a complete and comprehensive professional.
- It combines the Roman tradition of the *vir bonus* (practical and cultured man) with the technical demands of his discipline.
- This passage was highly influential during the Renaissance, especially upon the figure of the humanist architect.

Marcus Vitruvius Pollio

On architecture

Book I, Chapter 1.3

Cum in omnibus enim rebus, tum maxime etiam in architectura, haec duo insunt: quod significatur et quod significat. Significatur proposita res, de qua dicitur; hanc autem significat demonstratio rationibus doctrinarum explicata. Quare videtur utraque parte exercitatus esse debere qui se architectum profiteatur. Itaque eum etiam ingeniosum oportet esse et ad disciplinam docilem. Neque enim ingenium sine disciplina aut disciplina sine ingenio perfectum artificem potest efficere.

For in all things, and especially in architecture, two elements are present: what is signified and what signifies. What is signified is the proposed subject under discussion; what signifies it is a demonstration explained through the principles of the disciplines. Whoever professes to be an architect must therefore be trained in both. He must possess natural talent and be receptive to instruction, for neither talent without training nor training without talent can produce an accomplished practitioner.

Et ut litteratus sit, peritus graphidos, eruditus geometria, historias complures noverit, philosophos diligenter audierit, musicam scierit, medicinae non sit ignarus, responsa iurisconsultorum noverit, astrologiam caelique rationes cognitas habeat.

Textual note — I.1.3. The adopted text retains peritus *graphidos, the reading printed in the modern critical editions consulted. Since this edition offers no new recensio, variants are not attributed here to particular manuscripts, nor are formulas such as "codd." reproduced without direct verification in an identifiable critical apparatus.*

He must therefore be literate, skilled in drawing and trained in geometry; he must know historical narratives, have listened attentively to philosophers, understand music, possess some knowledge of medicine, be acquainted with the opinions of jurists, and understand astronomy and the workings of the heavens.

Critical Apparatus

- **Tum maxime etiam in architectura]** "Above all also in architecture". Etiam is retained in the Spanish edition and Krohn's text; no omission of etiam is adopted without a documented manuscript witness.
- **haec duo insunt: quod significatur et quod significat]** Vitruvius distinguishes the subject or matter under discussion from its demonstrative explanation through the principles of the disciplines. This is a semantic explanation, not a claim of manuscript unanimity.
- **docilem]** The word denotes a disposition or capacity to learn. No particular textual judgment is added where a relevant variant has not been documented. The Spanish edition heads this lexical note ingenio et disciplinae docilem; the running text has ad disciplinam docilem.
- **peritus graphidos]** Graphidos is a Greek genitive used in Latin by Vitruvius and refers to skill in drawing. It is translated according to its function in I.1.3–4.
- **eruditus geometria]** The meaning is "trained in geometry". No alternative form is reconstructed when it is unnecessary for the translation.
- **responsa iurisconsultorum noverit]** Vitruvius requires knowledge of the jurists' responses or opinions: sufficient familiarity with legal questions relevant to architectural practice.

Academic translation

"Indeed, in all things, but especially in architecture, these two elements are found: what is signified (*quod significatur*) and what signifies (*quod significat*). What is signified is the proposed thing being discussed; what signifies is the demonstration explained through the principles and reasoning of the

disciplines. Therefore, it seems that whoever proclaims himself an architect must be skilled in both. Thus, it is necessary that he possess natural talent and be receptive to teaching. For neither talent without discipline nor discipline without talent can produce a perfect craftsman."

Furthermore, he must be a man of letters, an expert in drawing, versed in geometry, familiar with numerous historical works, have listened attentively to philosophers, know music, be knowledgeable in medicine, be familiar with the opinions of legal experts, and have knowledge of astrology and the laws of the heavens.

Explanation of the Meaning of the Text (Academic Analysis)

This paragraph is of great importance because Vitruvius delves into the **semiotic and epistemological nature of** architecture and establishes the ideal educational program for the architect.

Main ideas:

1. **Theoretical distinction**: Vitruvius introduces the conceptual pair *quod significatur* (the real object, the thing itself) and quod *significat* (the theoretical representation, the rational demonstration). This distinction underscores that architecture is both a material reality and a body of knowledge that must be able to be rationally explained and justified.
2. **Balance between talent and instruction:** Neither innate genius (*ingenium*) without systematic training, nor study without natural ability, is sufficient. A combination of both is required.
3. **Encyclopedia of the Architect**: Vitruvius presents the first known list of knowledge that an architect must master. This encyclopedic training includes:

- Humanities (*litteratus*, history, philosophy)
- Arts (*graphics*, music)
- Exact sciences (*geometry*, *astrology*, *caeli rationes*)
- knowledge (*medicine*, law)

M. Vitruvii Pollionis
De architectura
Book I, Chapter 1.4

Quae cur ita sint, haec sunt causae. Litteras architectum scire oportet, uti commentariis memoriam firmiorem efficere possit. Deinde graphidis scientiam

habere, quo facilius exemplaribus pictis quam velit operis speciem deformare valeat. Geometria autem plura praesidia praestat architecturae, et primum ex euthygrammis circini tradit usum, ⟨regulaeque⟩ e quo maxime facilius aedificiorum in areis expediuntur descriptiones, normarumque et librationum et linearum directiones. Item per opticen in aedificiis ab certis regionibus caeli lumina recte ducuntur. Per arithmeticen vero sumptus aedificiorum consummantur, mensurarum rationes explicantur, difficilesque symmetriarum quaestiones geometricis rationibus et methodis inveniuntur.

The reasons for these requirements are as follows. The architect must be literate so that written notes may strengthen his memory. He must also know drawing, so that he can more easily represent the intended appearance of a work through drawings. Geometry provides architecture with many aids: first, it teaches the use of the straightedge and compasses, which facilitate the setting-out of buildings on their sites and the alignment of set squares, levels and lines. Optics enables light to be admitted correctly into buildings from particular quarters of the sky. Arithmetic is used to calculate construction costs, explain systems of measurement and resolve difficult questions of commensurability through geometrical reasoning and methods.

Critical Apparatus

- **Quae cur ita sint, haec sunt causae]** An explanatory transition introducing the reasons for the educational requirements.
- **graphidos scientiam]** Graphidos (Greek genitive) = art of technical and design drawing.
- **euthygrammii et circini]** This is the heading used by the Spanish edition's lexical note, which explains euthygrammium as a ruler for drawing straight lines. The adopted running text instead reads ex euthygrammis circini tradit usum ⟨regulaeque⟩; the heading must not be mistaken for an independently verified manuscript reading.
- **in areis expediuntur descriptiones]** Adopted reading. In areis = on the ground, in the lot.
- **normarumque et librationum]** Normae are set squares; librationes are leveling operations or levels.
- **per opticen]** It refers to optics (perspective and lighting).

- **per arithmeticen]** Arithmetic applied to the calculation of costs and measurements.
- **symmetriarum quaestiones]** Vitruvian central concept: harmonic proportions.

Academic translation

" Here are the reasons why this is so. The architect must know how to read and write, in order to strengthen his memory through written notes. Likewise, he must have knowledge of drawing, so that he can more easily represent, through exemplary drawings, the appearance of the work he wishes to design."

Geometry, for its part, provides architecture with numerous aids: firstly, it teaches the use of the ruler and compass, thanks to which the plans of buildings, as well as the directions of set squares, levels, and lines, can be drawn much more easily on the ground. Likewise, optics allows for the correct direction of light from certain regions of the sky towards buildings. Arithmetic allows for the calculation of construction costs, the explanation of the reasons for measurements, and the resolution of difficult questions of symmetry through geometric reasoning and methods.

Explanation of the Meaning of the Text

In this paragraph, Vitruvius begins to justify in detail why the architect must master each of the disciplines mentioned.

Main points:

1. **Letters (Litterae)**: They are used to take notes and consolidate memory (*commentarii*).

2. **Drawing (Graphidos scientia)**: An essential tool for visually materializing the ideas of the project.

3. **Geometry: A** fundamental discipline that provides practical tools (ruler, compass, set square, level) for drawing plans and carrying out construction work.

4. **Optics: Allows for the correct management of natural lighting in** buildings according to their orientation.

5. **Arithmetic:** Necessary for calculating costs, measurements and, especially, for solving problems of ***symmetria*** (harmonic proportion), one **of** the most important concepts of Vitruvian theory.

Vitruvius presents architecture here as a technical-scientific discipline **requiring a solid foundation** in the liberal and applied arts. This encyclopedic approach distinguishes the Roman architect from the mere **faber** *(*craftsman) and elevates him to the status of intellectual.

M. Vitruvii Pollionis
De architectura
Book I, Chapter 1.5

Historias autem plures novisse oportet, quod multa ornamenta saepe in operibus architecti designant, de quibus argumenti rationem, cur fecerint, quaerentibus reddere debent. Quemadmodum si quis statuas marmoreas muliebres stolatas, quae caryatides dicuntur, pro columnis in opere statuerit et insuper mutulos et coronas conlocaverit, percontantibus ita reddet rationem:

He must also know many historical narratives, because architects often include ornaments in their works and must explain the reasoning behind them to anyone who asks why they were used. Thus, if someone sets up marble statues of robed women, called caryatids, in place of columns, and places mutules and cornices above them, he will give the following explanation.

Carya, civitas Peloponnensis, cum Persis hostibus contra Graeciam consensit. Postea Graeci, per victoriam gloriose bello liberati, communi consilio Caryatibus bellum indixerunt. Itaque, oppido capto, viris interfectis, civitate deflagrata, matronas eorum in servitutem abduxerunt, nec sunt passi stolas neque ornatus matronales deponere, non uti una triumpho ducerentur, sed aeterna servitutis exemplo gravi contumelia pressae poenas pendere viderentur pro civitate. Ideo qui tunc architecti fuerunt aedificiis publicis designaverunt earum imagines oneri ferendo conlocatas, ut etiam posteris nota poena peccati Caryatium memoriae traderetur.

Caryae, a city in the Peloponnese, allied itself with the Persians against Greece. After their glorious victory had freed them from war, the Greeks jointly declared war on the inhabitants of Caryae. They captured the town, killed the men, laid waste to the city and carried its matrons into slavery. They did not allow the women to remove their robes or matronly ornaments: they were to be displayed not in a single triumph but as an enduring example of servitude, burdened with humiliation and paying the penalty for their city. The architects of that time therefore represented them in public buildings as figures bearing a load, so that

the punishment of the offense of the people of Caryae might be remembered by posterity.

Critical Apparatus

- **Historias autem plures nosse oportet]** Historias denotes historical and mythological narratives.
- **argumenti rationem, cur fecerint]** The expression means "the reason and rationale for the motif".
- **Carya, civitas Peloponnensis]** The passage names Caryae in the Peloponnese, distinct from Caria in Asia Minor.
- **Gloriose bello liberati]** "Gloriously freed from the war". Gloriose is the adverb in the adopted wording; the alternative glorioso is not attributed to an individual witness without documentary support.
- **civitate deflagrata]** The running text describes the city as burned down. the Spanish edition's lexical note instead uses the heading civitate desacrata and glosses it as "razed" or "ritually destroyed". These different expressions are distinguished here; no manuscript variant is inferred from the discrepant heading.
- **oneri ferundo]** Gerundive: "destined to bear a burden".
- **Caryatium]** Genitive plural referring to the people of Caryae. The association of their women with load-bearing figures belongs to Vitruvius's explanatory narrative.

Academic translation

"Furthermore, it is advisable for the architect to know many historical narratives, because he frequently designs numerous ornaments in his works, and he must be able to give an account of them — and explain the basis of his decision — to those who ask him."

Thus, for example, if someone places marble statues of women dressed in long tunics — called caryatids[107] — in place of columns, and places mutules and

107 Caryatids are sculpted female figures that replace columns as supports for an entablature; the canonical example is the porch of the Erechtheion on the Acropolis at Athens (c. 421–406 BC). In 1.1.5 Vitruvius offers an aetiological explanation intended to show why architects must know history: the women of Caryae, a town in Laconia that sided with Persia, were supposedly enslaved and their images condemned to bear the weight of a building for ever. The story is now regarded as a late aetiological construction rather than the actual origin of the motif, which

cornices on top of them, he will give the following explanation to those who ask him:

The city of Caryae, in the Peloponnese, allied itself with the Persians, enemies of Greece. Subsequently, the Greeks, gloriously liberated by their victory in the war, declared war on the inhabitants of Caryae by common agreement. Therefore, having captured the city, killed the men, and razed the city, they led its matrons into servitude, not allowing them to remove their tunics or matronly ornaments, so that they would not be paraded only once in triumph, but rather, oppressed by grave affront and as an eternal example of servitude, they would seem to atone before posterity for the guilt of their city. For this reason, the architects of that time depicted their images in public buildings carrying a burden, so that the memory of the punishment for the crime of the women of Caryae would also reach future generations.

Explanation of the Meaning of the Text

This paragraph is one of Vitruvius' most famous and constitutes the legendary origin of the caryatids.

Key points:

1. **The Usefulness of History**: The architect must not only know how to build, but also provide cultural and historical justification for the ornamental elements he employs. For Vitruvius, architecture is an eloquent art that "speaks" through its forms.

2. **The caryatid narrative**: Vitruvius gives an aetiological explanation for the architectural figure. He names Caryae in the Peloponnese, which must be distinguished from Caria in Asia Minor. His account presents the load-bearing women as an enduring image of the punishment and humiliation imposed on their city. The historical status of that account remains distinct from its symbolic function in the treatise.

3. **Symbolic value: This passage illustrates** how Roman (and Greek) architecture used figurative elements with a strong moral and commemorative content.

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scholarship associates instead with archaic korai and the cult of Artemis Caryatis, whose ritual dances were performed by the girls of Caryae.

On architecture
Book I, Chapter 1.6

Non minus Lacones, Pausania Agesilae filio duce, Plataico proelio pauca manu infinitum numerum exercitus Persarum cum superavissent, acto cum gloria triumpho spoliorum et praedae, porticum Persicam ex manubiis, laudis et virtutis civium indicem, victoriae posteris pro tropaeo constituerunt. Ibique captivorum simulacra barbarico vestis ornatu, superbia meritis contumeliis punita, sustinentia tectum conlocaverunt, uti et hostes horrescerent timore eorum fortitudinis effectus, et cives id exemplum virtutis aspicientes gloria erecti ad defendendam libertatem essent parati. Itaque ex eo multi statuas Persicas sustinentes epistylia et ornamenta eorum conlocaverunt, et ita ex eo argumento varietates egregias auxerunt operibus. Item sunt aliae eiusdem generis historiae, quarum notitiam architectos tenere oporteat.

No less the Laconians, led by Pausanias, the son of Agesilaus, having defeated an immense Persian army with a small force in the battle of Plataea, having celebrated a glorious triumph of spoils and booty, erected a Persian portico from the proceeds of the spoils, a token of the praise and virtue of the citizens, and a trophy of victory for posterity. And there they placed the effigies of captives adorned with barbarian clothing, their pride punished with deserved insults, supporting a roof, so that both the enemies might shudder with fear at the effects of their fortitude, and the citizens, beholding that example of virtue, might be raised in glory and ready to defend their liberty. Therefore from it many placed Persian statues supporting their epistyles and ornaments, and thus from that argument they increased excellent varieties in their works. Likewise there are other stories of the same kind, of which architects should keep a knowledge.

Critical Apparatus

- Agesilae filio] Krohn retains "son of Agesilaus," and the translation follows the adopted text. Historically, the commander at Plataea was Pausanias son of Cleombrotus (Herodotus 9.10). The patronymic in Vitruvius is therefore distinguished from the historical identification; it is not silently corrected in the Latin.
- **Plataico proelio]** It refers to the Battle of Plataea (479 BCE).
- **pauca manu]** An idiomatic expression: with a handful of men.

- **porticum Persicam ex manubiis]** Manubiae = booty of war.
- **laudis et virtutis civium indicem]** "As a testimony to the honor and valour of the citizens".
- **superbia meritis contumeliis punita]** "Their pride punished with deserved humiliations". The phrase concerns the captives collectively, not the pride of a single unnamed man.
- **sustinentia tectum]** Standard reading. "Supporting the roof."
- **Timore eorum fortitudinis effectus]** In context, the enemies are to shudder in fear at the effects of the Laconians' courage. The note explains the sentence without presenting an unidentified editorial correction as manuscript evidence.

Academic translation

"Likewise, the Lacedaemonians, under the command of Pausanias, son of Agesilaus, after having won at the Battle of Plataea with a small contingent against an immense number of the Persian army, and after celebrating a glorious triumph with the spoils and booty, erected the Persian Portico with the spoils of war, as a testimony to the honor and valour of their citizens and as a trophy of victory for posterity."

There they placed images of the captives, dressed in barbaric clothing, punished with affronts deserved for their pride, holding up the roof, so that the enemies would be horrified by the effect of their bravery and so that the citizens, contemplating that example of virtue, would feel exalted by glory and be ready to defend their freedom.

For this reason, many architects later placed Persian statues holding epistyles and ornaments, and thus, from this motif, introduced excellent decorative varieties into their works. Likewise, there are other stories of the same kind that the architect should know.

Explanation of the Meaning of the Text

In this paragraph, Vitruvius continues with the example of the usefulness of historical knowledge for the architect, offering a second case parallel to that of the caryatids: **the Persian statues** (sometimes called "Persians " or "Persian captives ").

Key points:

1. **Historical context: Vitruvius refers to the Greek victory at the Battle of Plataea (479 BCE), which ended the Persian Wars. The Spartans (Laconians), under the command of Pausanias, erected the Persian Stoa (Persike Stoa) in Sparta as a commemorative monument.**
2. **Symbolic function: The figures of captive Persians supporting the** roof represent the triumph of Greek freedom over barbarian arrogance. They serve a dual **purpose**:
    - Intimidation of potential enemies.
    - Moral example and motivation for citizens.
3. **Importance for architecture**: These decorative elements are not mere ornaments, but **bearers of historical and moral significance**. The architect must know their origin in order to explain them and justify their use.

This passage reinforces the central idea of the chapter: the architect must be a cultured man, capable of endowing his works with intellectual and symbolic content, and not just technical content.

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De architectura
Book I, Chapter 1.7

Philosophia vero perficit architectum animo magno et uti non sit adrogans, sed potius facilis, aequus et fidelis, sine avaritia; quod est maximum. Nullum enim opus vere sine fide et castitate fieri potest. Ne sit cupidus neque in muneribus accipiendis habeat animum occupatum, sed cum gravitate suam tueatur dignitatem bonam famam habendo. Et haec enim philosophia praescribit.

Philosophy gives the architect breadth of mind and teaches him to be neither arrogant nor greedy, but approachable, fair and trustworthy. Above all, no work can be properly carried out without good faith and integrity. He should not be covetous or preoccupied with accepting gifts, but should uphold his dignity with seriousness and maintain a good reputation. These are the precepts of philosophy.

Praeterea de rerum natura, quae Graece φυσιολογία dicitur, philosophia explicat, quam necesse est studiosius novisse, quod habet multas et varias naturales quaestiones, ut etiam in aquarum ductionibus. Incursibus enim et circumitionibus et librata planitie expressionibus spiritus naturales aliter atque

aliter fiunt, quorum offensionibus mederi nemo poterit nisi qui ex philosophia principia rerum naturae noverit. Item qui Ctesibii aut Archimedis et ceterorum qui eiusdem generis praecepta conscripserunt leget, sentire non poterit nisi his rebus a philosophis erit institutus.

Philosophy also explains the nature of things, which the Greeks call physiologia. The architect must study it carefully because it involves many different natural problems, including those encountered in water supply. At bends, turns and changes of level, the pressure of air acts in different ways; no one can remedy the resulting difficulties without knowing the principles of nature through philosophy. Nor can anyone understand the writings of Ctesibius[108], Archimedes[109] and others who set out precepts of the same kind without instruction in these matters from philosophers.

Critical Apparatus

- **animo magno]** The reading of the adopted text, also printed by Krohn, means "with breadth or greatness of mind". Animo is an ablative; the adjective must agree with it.
- **facilis, aequus et fidelis]** Moral virtues of the ideal architect.
- **sine fide et castitate]** Castitas = integrity, probity, honesty.
- **φυσιολογία]** Greek term correctly transcribed (physiologia = study of nature).
- **in aquarum ductionibus]** A reference to the conveyance of water in aqueducts and other conduits.
- **[incursibus enim et circumitionibus**] Adopted reading. It refers to the movements and pressures of air and water.
- **Ctesibii aut Archimedis]** Ctesibius of Alexandria and Archimedes, the great Hellenistic engineers.

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108 Ctesibius (Greek Κτησίβιος) was a Greek inventor, hydraulic engineer and mathematician associated with Alexandria in the third century BC. Ctesibius was especially important for Hellenistic hydraulics and mechanical invention. The dates 285–222 BC should not be used as secure birth and death dates without independent evidence; the chronology of Ctesibius and that of Archimedes must not be conflated. Compare the Aquincum Museum's account, "Ctesibius: The barber of Alexandria", which places his activity in the early third century BC.

109Archimedes of Syracuse (Ἀρχιμήδης; c. 287–c. 212 BCE) was a Greek mathematician, engineer, inventor and astronomer. An etymological interpretation of his name requires linguistic evidence and should be distinguished from a symbolic reading of his role in this work.

Academic translation

"Philosophy, for its part, perfects the architect in spirit, so that he is not arrogant, but rather gentle, fair, and loyal, and — most importantly — free from avarice. For no work can truly be accomplished without loyalty and integrity. Let him not be covetous or preoccupied with receiving gifts, but let him uphold his dignity with gravity, maintaining a good reputation. And this is precisely what philosophy prescribes."

Furthermore, philosophy explains the nature of things, what in Greek is called *physiologia*, a body of knowledge that must be mastered with special dedication, since it encompasses many and varied natural matters, as is also the case with water management. Indeed, the impulses, circulations, and pressures of natural air occur in very different ways depending on the differences in elevation and forced conduits; and no one will be able to solve their problems without knowing, thanks to philosophy, the principles of nature. Likewise, whoever reads the precepts written by Ctesibius, Archimedes, and other authors of the same kind will not be able to fully understand them unless they have been instructed in these matters by philosophers.

Explanation of the Meaning of the Text

In this paragraph, Vitruvius explains the fundamental role of philosophy in the training of the architect, dividing it into two main aspects:

1. **Moral (ethical) formation**: Philosophy shapes the architect's character, instilling essential virtues such as humility, fairness, fidelity, and above all, the absence of greed. Vitruvius emphasizes that moral integrity (*fides et castitas*) is indispensable for practising the profession with dignity.

2. **Scientific training (physics / physiology)**: Architects need knowledge of natural philosophy to understand complex physical phenomena, especially in hydraulics (aqueducts, water and air pressure). Without these principles, they would be unable to solve real-world technical problems.

Vitruvius further links theory with practice by mentioning great Hellenistic engineers (Ctesibius and Archimedes), whose treatises can only be properly understood with a philosophical basis.

This passage reinforces the Vitruvian ideal of the architect as a complete professional: not just a technician, but a cultured, ethical and scientifically trained man.

M. Vitruvii Pollionis
De architectura
Book I, Chapter 1.8

Musicen autem sciat oportet, uti canonicam rationem et mathematicam notam habeat, praeterea ballistarum, catapultarum scorpionum temperaturas possit recte facere. In capitulis enim dextra ac sinistra sunt foramina hemitoniorum, per quae tenduntur suculis et vectibus e nervo torti funes, qui non praecluduntur nec praeligantur nisi sonitus ad artificis aures certos et aequales fecerint. Bracchia enim, quae in eas tentiones includuntur, cum extenduntur, aequaliter et pariter utraque plagam mittere debent. Quodsi non homotona fuerint, inpedient directam telorum missionem.

He must know music so that he understands harmonic and mathematical principles and can correctly adjust the tensions of ballistae, catapults and scorpions. In their frames, on the right and left, are openings for the hemitonia, through which twisted sinew cords are tensioned by winches and levers. These are not secured until they produce clear and equal sounds to the craftsman's ear. The two arms inserted into these torsion bundles must deliver their impulse equally when drawn back; if they are not tuned alike, they will prevent a straight discharge of the missiles.

Critical Apparatus

- **Musicen autem sciat oportet]** Musicen = music (in the broad sense: musical and harmonic theory).
- **canonicam rationem]** It refers to the theory of musical (canonical) proportions.
- **ballistarum, catapultarum et scorpionum]** The three main types of torsion war machines.
- **foramina hemitoniorum]** Openings for the torsion bundles of the artillery frame. The musical context explains the equal tuning of the two sides; the phrase does not mean "holes of half-tones".
- **e nervo torti funes]** Twisted cords of tendons or nerves of animals.
- **homotona]** A Greek term meaning "of the same pitch" or "at the same tension".
- **impedient directam telorum missionem]** Important technical observation on the accuracy of the shot.

Academic translation

"Likewise, he must know music, in order to master canonical reason and mathematical notation, and to be able to correctly adjust the tensions of the ballistas, catapults and scorpions."

Indeed, in the capitals of these machines there are, on the right and left, holes for the hemitonia, through which twisted cords of sinew are tensioned by means of capstans and levers. These cords are not locked or permanently fixed until they produce, to the ear of the craftsman, an equal and uniform sound on both sides. For the arms that are inserted into these tensions, when extended, must deliver the blow equally and evenly. If they are not in the same pitch (*homotonic*), they will prevent the projectiles from being launched straight.

Explanation of the Meaning of the Text (Academic Analysis)

In this paragraph, Vitruvius justifies the need for the architect to master music **(**understood as harmonic and acoustic theory) for an eminently practical reason: the calibration of torsion war machines.

Key points:

1. **Connection between music and mechanics**: Vitruvius establishes a direct relationship between musical theory (harmonic proportions, tones, intervals) and military engineering. The correct tension of the machine's strings is achieved by ear, applying acoustic principles (*sonitus certos et aequales*).

2. **Key technical concept**: *Homoton* (equal pitch/equal tension). If the two halves of the torsion engine are not perfectly balanced, the weapon will lose accuracy and the projectile will deviate from its trajectory.

3. **vision of architecture**: This example perfectly illustrates the Vitruvian thesis: the architect is not only a builder, but a technician -scientist who must apply knowledge from different disciplines (in this case, music) to concrete problems of design and execution.

This passage is especially interesting because it shows how, in Antiquity, disciplines that we now consider separate (music and military art) were closely linked through mathematics and the theory of proportions.

M. Vitruvii Pollionis
De architectura

Book I, Chapter 1.9

Item theatris vasa aerea, quae in cellis sub gradibus mathematica ratione conlocantur, sonitûm ex discrimine, quae Graeci ἠχεῖα appellant, ad symphonias musicas sive concentus componuntur, divisa in circinatione diatessaron et diapente et diapason ad disdiapason, uti vox scaenici sonitu conveniens in dispositionibus tactu cum offenderit, aucta cum incremento clarior et suavior ad spectatorum perveniat aures. Hydraulicas quoque machinas et cetera quae sunt similia his organis sine musicis rationibus efficere nemo poterit.

Likewise, in theaters bronze vessels, which the Greeks call echea, are placed in niches beneath the seating according to mathematical principles and tuned to musical intervals. Arranged around the theater according to fourths, fifths, octaves and double octaves, they receive the actor's voice and reinforce it by resonance, so that it reaches the spectators' ears more clearly and pleasantly. Hydraulic organs and other similar instruments likewise cannot be constructed without knowledge of musical principles.

Critical Apparatus

- **vasa aerea]** Corrected reading. Vessels and urns of bronze.
- **quae Graeci ἠχεῖα appellant]** Ἠχεῖα (echeia) = acoustic resonators.
- **diatessaron et diapente et diapason ad disdiapason]** Musical intervals: fourth, fifth, octave and double octave.
- **[in circinatione**] Adopted reading. It refers to the circular or semicircular arrangement under the steps.
- **scaenici sonitus]** The voice of the actors on stage.
- **hydraulicas quoque machinas]** Reference to the hydraulic organs (hydraulis) of Ctesibius.

Academic translation

" Likewise, in theaters, bronze vessels are placed in niches under the seating according to mathematical principles. These vessels, which the Greeks call *echeia* (ἠχεῖα), are tuned according to the intervals of musical harmonies or chords, distributed in circles according to the fourth, the fifth, the octave, and the double octave, so that the actor's voice, resonating properly in these arrangements, striking them, augmented and enriched, reaches the ears of the spectators more clearly and more softly."

Explanatory note — Bk. 5.4–5.5 (the echea and theater acoustics). Vitruvius founds theater acoustics on the Harmonics of Aristoxenus of Tarentum: in 5.4 he sets out the three genera —enharmonic, chromatic, and diatonic— and the division of the voice into tones, semitones, and tetrachords; in 5.5 he applies that theory to architecture through the echea (ἠχεῖα), bronze vessels —or clay ones, in modest theaters— tuned to the notes of the scale and set in niches under the seating to reinforce the actors' voices by resonance. The exact scheme of their positions (5.5.6) is lost in transmission. Vitruvius notes that wooden theaters need none, since the boarding itself resonates; masonry, stone, or marble theaters do. He admits he has seen none in Rome, citing as witness Lucius Mummius, who after destroying Corinth (146 BCE) brought the bronze echea of its theater to Rome and dedicated them at the temple of Luna. Archaeology has found almost no trace of them in ancient theaters; they reappear, however, in some two hundred medieval churches.

Comparative note — Bk. 5.4–5.5 (echea). In the Budé, Book V is the work of Catherine Saliou (2009), whose commentary on the theater and its acoustics is standard. In the Cambridge commentary, Thomas N. Howe observes that Vitruvius here singles out an uncommon Greek technical feature, for which only between eight and sixteen possible sites are known. Granger (Loeb) preserves the Greek musical terminology (nete, paramese, mese, hypate); Corso–Romano and Tavernor–Schofield accompany the passage with diagrams of the scale. In 5.5 the manuscript tradition presents a crux (diatessaron for diapente in the series of intervals), discussed since Rose; this edition follows Rose's text and translates in its own voice.

Nor could anyone build hydraulic machines or other instruments similar to these organs without knowing the principles of music.

Explanation of the Meaning of the Text

In this paragraph, Vitruvius continues to justify **the** need for musical knowledge for the architect, now moving from the military field to **the acoustic - architectural field**.

Key points:

1. Theater acoustics: Vitruvius describes one of the most sophisticated acoustic systems of Antiquity: the *echeia*, or bronze resonating vessels. These

were strategically placed under the seating tiers of theaters to amplify and enhance the sound quality of the actors.

2. **Mathematical -musical foundation**: The tuning of these vessels was carried out according to the Greek harmonic intervals (diatessaron = fourth, diapente = fifth, diapason = octave), demonstrating the practical application of Pythagorean musical theory in architecture.

3. **Comprehensive vision**: Music is not a cultural embellishment, but an indispensable technical tool. Without it, **an** architect could not properly design theaters or build complex instruments like the hydraulic organ.

This passage is one of the most important sources we have on acoustics in ancient theaters and demonstrates the high degree of technical and scientific sophistication that Vitruvius demanded of the architect.

M. Vitruvii Pollionis
De architectura
Book I, Chapter 1.10

Disciplinam vero medicinae novisse oportet propter inclinationem caeli, quae Graeci κλίματα dicunt, et aeris et locorum qui sunt salubres aut pestilentes, aquarumque usus. Sine his enim rationibus nulla salubris habitatio fieri potest. Iura quoque nota habeat oportet ea quae necessaria sunt aedificiis ⟨locis⟩ communibus parietum ad ambitum stillicidiorum et cloacarum luminum, item aquarum ductiones. Et cetera quae eiusmodi sunt nota oportet sint architectis, uti ante caveant quam instituant aedificia, ne controversiae factis operibus patribus familiarum relinquantur, et ut legibus scribendis prudentia cavere possit et locatori et conductori. Namque si lex perite fuerit scripta, erit ut sine captione uterque ab utroque liberetur.

The architect must also know medicine, because of the inclinations of the sky, which the Greeks call klimata, the qualities of the air, the healthfulness or unhealthfulness of places and the uses of water. Without this knowledge no healthy dwelling can be built. He must understand the legal provisions needed for buildings: party walls, boundaries, rainwater runoff, drains, rights of light and water supply. Architects must know these matters before construction begins, so that disputes are not left to householders after the work is complete and so that carefully drafted contracts protect both parties. If a contract is

expertly drawn up, each can discharge his obligations to the other without deception or prejudice.

Ex astrologia autem cognoscitur oriens, occidens, meridies, septentrio, etiam caeli ratio, aequinoctium, solstitium, astrorum cursus. Quorum notitiam si quis non habuerit, horologiorum rationem omnino scire non poterit.

From astrology, however, one knows east, west, south, north, and also the system of the heavens, the equinox, the solstice, and the course of the stars. If one does not have knowledge of these, he will not be able to know the system of clocks at all.

Critical Apparatus

- **inclinationes caeli, quas Graeci κλίματα dicunt]** Κλίματα = climates / celestial regions / inclinations.
- **communium parietum]** Party walls or walls held in common.
- **ad ambitum stillicidiorum]** Stillicidia denotes rainwater dripping or running off the eaves, together with the corresponding right of discharge.
- **locatori et conductori]** The parties to a contract of letting and hiring. In this building context the terms refer to the employer or owner commissioning the work and the contractor undertaking it; their wider meanings include lessor and lessee.
- **sine captione]** "Without deception" or "without loss".
- **horologiorum rationem]** It refers to the design and operation of sundials.

Academic translation

"He must also know the discipline of medicine because of the inclinations of the heavens — which the Greeks call *klimata* —as well as the qualities of the air, of healthy or pestilent places, and of the use of water. For without this knowledge it is not possible to build any healthy dwelling."

It is also advisable that they be familiar with the necessary legal principles relating to buildings, such as those concerning party walls, rainwater runoff, sewers, lighting, water pipes, and other similar matters. All of this should be known by architects so that they can take precautions before beginning construction and avoid leaving disputes for the owners once the work is completed, and so that, through prudent drafting of contracts, both the

employer and the contractor can be protected. For if the contract is skilfully written, both will be mutually released without suffering any harm.

Through astrology, one can know the east, the west, south, and north, as well as the arrangement of the sky, the equinoxes, the solstices, and the course of the stars. Anyone who lacks knowledge of these subjects will be completely unable to understand the principle of sundials.

Explanation of the Meaning of the Text

In this paragraph, Vitruvius concludes the enumeration of the disciplines that the architect must master, highlighting three areas of great practical importance:

1. **Environmental Medicine / Hygiene**: The architect must know how to choose healthy sites according to the climate (*klimata*), air quality, soil and water, anticipating health problems (a very Roman theme).
2. **Law**: Basic legal knowledge to avoid litigation related to construction (common walls, easements for light, water, rainwater runoff, sewers, etc.). Vitruvius emphasizes the architect's responsibility in preventing legal conflicts.
3. **Astrology / Astronomy:** Necessary for the correct orientation of buildings and, especially, for the design of sundials (*horology*).

This chapter (I.1) presents the Vitruvian ideal of the architect as an encyclopedic professional, capable of integrating technical, scientific, humanistic, and juridical knowledge. None of these disciplines is accessory: they all respond to the concrete needs of his office.

Marcus Vitruvius Pollio
On architecture
Book I, Chapter 1.11

Cum ergo tanta haec disciplina sit condecorata et abundans eruditionibus variis ac pluribus, non puto posse ⟨se⟩ iuste repente profiteri architectos nisi qui ab aetate puerili his gradibus disciplinarum scandendo, scientia plerarumque litterarum et artium nutriti pervenerint ad summum templum architecturae.

Since this discipline is enriched by so many different branches of learning, I do not think anyone can rightly profess to be an architect without having climbed the steps of those disciplines from childhood, nourished by knowledge of letters and arts, until reaching the highest sanctuary of architecture.

Critical Apparatus

- **tanta haec disciplina sit condecorata]** Condecorata = adorned, enriched, dignified.
- **abundans eruditionibus variis ac pluribus]** Emphasizes the richness and variety of knowledge.
- **profiteri architectos]** Profiteri = to declare oneself publicly, to proclaim oneself an architect.
- **his gradibus disciplinarum scandendo]** Beautiful metaphorical image: "ascending these steps of the disciplines".
- **ad summum templum architecturae]** Metaphor of the temple as the summit or supreme sanctuary of architecture.

Academic translation

"Since this discipline is so vast and so richly adorned with multiple and varied forms of erudition, I do not believe that anyone can justly proclaim themselves an architect suddenly, but only those who, from childhood, ascending these steps of disciplines and nourished with the knowledge of numerous letters and arts, have reached the highest temple of architecture."

Explanation of the Meaning of the Text

This paragraph gives a climactic formulation of the architect's educational ideal. It does not end Chapter 1: the discussion continues in sections 12–18.

Main ideas:

1. **Encyclopedic character of architecture**: Vitruvius insists that architecture is not a simple technique, but a vast discipline (*so much discipline*) that requires broad and deep training.
2. **Gradual training from childhood**: The true architect does not emerge spontaneously or suddenly. It requires a long educational process that begins in childhood (*ab aetate puerili*), comparable to climbing a ladder step by step.
3. **Temple metaphor**: The expression *ad summum templum architecturae* is particularly beautiful and meaningful. It presents architecture as a sacred temple accessible only after a rigorous journey of intellectual development. This image had a great influence on the Renaissance.

Vitruvius here establishes a high professional standard: the architect is not a mere craftsman, but a universal intellectual who crowns an encyclopedic education with mastery of his art.

«12. At fortasse mirum videbitur inperitis, hominis posse naturam tantum numerum doctrinarum perdiscere et memoria continere. Cum autem animadverterint omnes disciplinas inter se coniunctionem rerum et communicationem habere, fieri posse faciliter credent. Encyclios enim disciplina uti corpus unum ex his membris est composita. Itaque qui a teneris aetatibus eruditionibus variis instruuntur, omnibus litteris agnoscunt easdem notas communicationemque omnium disciplinarum, et ea re facilius omnia cognoscunt. Ideoque de veteribus architectis Pytheos, qui Prieni aedem Minervae nobiliter est architectatus, ait in suis commentariis architectum omnibus artibus et doctrinis plus oportere posse facere quam qui singulas res suis industriis et exercitationibus ad summam claritatem perduxerunt. Id autem re non expeditur.»

"12. Those unfamiliar with the subject may find it surprising that a person can learn so many disciplines thoroughly and retain them in memory. Once they recognize that the disciplines are connected and share their subject matter, however, they will readily believe it possible. Encyclopedic education is composed of these members as a single body. Those instructed in varied learning from an early age therefore recognize the same characteristics throughout the branches of knowledge and the connections among them, and so learn more easily. Thus Pytheus[110], one of the ancient architects, who designed the celebrated temple of Minerva at Priene[111], states in his commentaries that an architect ought to be able to accomplish more in all the arts and disciplines than

110 Pytheus was one of the most renowned architects of fourth-century BC Greece and also practised sculpture. According to Vitruvius (IV.3.1), he disparaged the Doric order for the "faults and inconsistencies" caused by the problematic positioning of triglyphs, and cultivated the Ionic order instead, using it for the temple of Athena at Priene, built around 340–330 BC. The dedicatory inscription, now in the British Museum, records Alexander the Great as its founder.

111 Legend has it that it was founded by Philotas and Epitus, son of Neileus, in Carian territory. Because they were Boeotians, it was called Cadme. It was an important religious center, comprising the Panjonium, a temple of Poseidon, a temple of Athena, and one of Demeter.

those who have brought a single field to the highest distinction through their own diligence and practice. This, however, cannot be achieved in reality."[112]

Critical and Hermeneutic Translation

"12. Those unfamiliar with the subject (inperitis) may find it surprising that human nature can master and retain so many disciplines. Once they recognize the close connection and mutual exchange among all branches of knowledge, however, they will readily believe it possible. Encyclopedic education (encyclios disciplina) forms a single body composed of these members. Those trained in different fields from an early age therefore recognize the same features and the connections shared by all the disciplines, and so understand everything more readily. For this reason Pytheos, the distinguished architect of Minerva's temple at Priene, states in his commentaries that an architect should be able to accomplish more in every art and discipline than specialists who, through sustained practice, have brought a single field to the highest distinction."

However, the latter is not feasible in reality.

Exegetical Notes

1. The *Encyclios Disciplina* as a mystical body: Vitruvius uses a metaphor of Stoic and Platonic origin: education is a living organism (*uti corpus unum*), where geometry, music, and astronomy are not isolated sciences, but rather the "members" (*membris) of a single being. This is fundamental: the architect does not accumulate knowledge in a fragmented way; the architect understands the* common mathematical root that unites sound (music) with space (geometry) and time (astronomy).

2. The rectification of Pytheus (The tension between Idea and Matter): Pytheus (the great Hellenistic architect of the Temple of Priene and the Mausoleum at Halicarnassus) was a radical in his theory; he asserted that the architect should know more about painting than a painter and more about sculpture than a sculptor. Vitruvius, with the Roman pragmatism that characterizes his framework, reins him in by closing the paragraph: *Id autem re non expeditur*. Vitruvius knows that human beings have physical limitations.

112Encyclios disciplina concerns an interconnected general education. The expression is related to Greek ἐγκύκλιος παιδεία (enkyklios paideia); it is distinct from the later ecclesiastical use of "encyclical".

The architect should not compete in manual dexterity with the specialist, but rather surpass them in the overall vision and geometric integration of the work.

3. The concept of *Notes*: The Carolingian text uses the word *notes* (characters, signs, marks). Vitruvius is saying that the wise person who studies from childhood discovers that the mathematical "marks" that govern a musical chord are the same "marks" that define the proportions of a column. Architecture is the science that knows how to read these universal notes and engrave them in stone.

«13. Non enim debet nec potest esse architectus grammaticus uti fuerat Aristarchus, sed non agrammatus, nec musicus ut Aristoxenus, sed non amusos, nec pictor ut Apelles, sed graphidos non inperitus, nec plastes quemadmodum Myron seu Polyclitus, sed rationis plasticae non ignarus, nec denuo medicus ut Hippocrates, sed non aniatrologetus, nec in ceteris doctrinis singulariter excellens, sed in îs non inperitus. Non enim in tantis rerum varietatibus elegantias singulares quisquam consequi potest, quod earum ratiocinationes cognoscere et percipere vix cadit in potestatem.»

"13. The architect neither needs nor is able to be a grammarian like Aristarchus, but he must not be illiterate; nor a musician like Aristoxenus, but he must not be ignorant of music; nor a painter like Apelles, but he must not be unskilled in drawing; nor a sculptor like Myron or Polyclitus, but he must know the principles of sculpture; nor a physician like Hippocrates, but he must not be ignorant of medicine. In the other disciplines too, he need not excel individually, but must have some knowledge of them. No one can attain exceptional refinement in such a variety of subjects, since even understanding and grasping their theoretical principles is scarcely within human capacity."

Critical Translation

"13. Indeed, the architect neither should nor can be a philologist or grammarian like Aristarchus, but that does not mean he should be illiterate (*agrammatos*); he should not be a musician like Aristoxenus, but neither should he be unfamiliar with music (*amusos*); he should not be a painter like Apelles, but he should be skilled in drawing (*graphidos non inperitus*); he should not be a sculptor of the stature of Myron or Polyclitus, but he should know the laws of plastic arts (*rationis plasticae non ignarus*); nor should he be a physician like Hippocrates, but that does not mean he should be ignorant of the principles of

medicine (*aniatrologetos); finally, he is not required to excel in the other sciences, but he must have a knowledge* of them that is not inexperienced (*non inperitus).”* In the midst of such a vast variety of subjects, no one can achieve singular mastery or refinement (*elegantias singulares*), since knowing and thoroughly assimilating its theoretical principles (*ratiocinationes*) is something that barely falls within the capabilities of the human intellect.

Exegetical notes

1. **The constellation of Hellenistic archetypes:** Vitruvius here maps out the greatest sages of the classical world to define **the** boundaries of architecture. He cites **Aristarchus** (the great grammarian of Alexandria who standardized Homer's text), **Aristoxenus** (the great theorist of music and the harmonic scale), **Apelles** (Alexander the Great's favorite painter), **Myron and Polyclitus** (the fathers of the canon of Greek sculpture), and **Hippocrates (the father of medicine). By contrasting the architect with these giants, Vitruvius** demonstrates that architecture is an integrative discipline: the architect does not displace the specialist, but rather acts as the conductor who coordinates all these areas of knowledge within the realm of the building.

2. **The structure of double negations (*non agrammatos*, *non amusos*):** This philological subtlety is relevant. Vitruvius does not use Vulgar Latin; he resorts to negated Hellenisms to indicate a state of **critical competence**. The architect does not have to compose a symphony like Aristoxenus, but he cannot be *amusos* (deaf to harmony), because if he were, he would not know how to place the acoustic vessels in the theater (Book V). He does not have to sculpt the Doryphoros like Polyclitus, but he must understand *ratio plastica* so that the statues of the caryatids maintain the modular proportion with the entablature. It is an apologia for the **knowledge of synthesis**.

3. **The Limit of Human *Power*:** The paragraph's conclusion is a lesson in epistemological humility in the face of Pytheus’s abstract intellectualism. Vitruvius acknowledges that the absolute mastery of the singular refinements (*elegantias singulares*) of each science eludes the power (*potestas*) of human understanding. Architecture, therefore, is defined as the science of the **possible and the harmonious**: it prioritizes the balance of the whole over the hyper-

specialized obsession with the fragment. This aligns with the thesis on Sophia: the true sage is the one who unifies, not the one who atomizes.

This fragment (I, 1, 14) masterfully concludes Vitruvius's syllogism on the nature of architectural knowledge. Vitruvius introduces an *a fortiori* argument (from lesser to greater): if specialists themselves — who dedicate their entire lives to a single discipline — rarely achieve universal acclaim, then demanding that the architect surpass them all in their respective fields is a logical contradiction. The architect's role is not competition, but technical coordination and self-sufficiency (*ne quid indigeat*).

The transmitted text exhibits deficiencies in textual cohesion and decontextualized turns of phrase such as " in private the properties of the arts, " which is an erroneous translation of *privatim proprietates tenent artium* (which refers to " those who possess the exclusive mastery of a particular art "). Similarly, *aevo perpetuo* does not allude to " the nobility of the time," but to an " imperishable celebrity / immortal fame. "

The Latin text, established on the review of Rose (confronted with Krohn), is presented below, with its critical translation and corresponding apparatus:

Latin text

«14. Nec tamen non tantum architecti non possunt in omnibus rebus habere summum effectum, sed etiam ipsi qui privatim proprietates tenent artium non efficiunt ut habeant omnes summum laudis principatum. Ergo si in singulis doctrinis singuli artifices neque omnes sed pauci aevo perpetuo nobilitatem vix sunt consecuti, quemadmodum potest architectus, qui pluribus artibus debet esse peritus, non id ipsum mirum et magnum facere ne quid ex his indigeat, sed etiam ut omnes artifices superet qui singulis doctrinis adsiduitatem cum industria summa praestiterunt.»

“14. Not only are architects unable to achieve the highest accomplishment in every field; even specialists in individual arts do not all attain the highest distinction. If, in each discipline, only a few practitioners have scarcely won lasting renown, how can an architect, who must be skilled in many arts, be expected to surpass all the specialists who have devoted their utmost diligence and sustained effort to a single subject? Is it not already a remarkable achievement that he should lack none of the knowledge he needs?”

Critical and Hermeneutic Translation

"14. And yet, not only are architects unable to achieve supreme perfection (*summum effectum*) in all matters, but even those who possess exclusive mastery of a particular art (*privatim proprietates tenent artium*) do not, in their entirety, attain the highest principality of glory. Therefore, if in individual sciences particular artists — and of them not all, but only a few throughout the ages (*aevo perpetuo*) —have barely achieved renown, how is it possible that an architect, who must be skilled in multiple arts, accomplishes the prodigious and admirable feat not only of lacking none of the necessary knowledge in them (*ne quid ex is indigeat*), but of surpassing even all those artisans and specialists who have devoted absolute assiduity and the utmost industry to a single doctrine? "

Exegetical notes

1. Deconstructing the Myth of the Absolute Sage: This passage is a compelling argument for disassociating Vitruvius from the hyperbolic readings of the Renaissance. While the humanists of the *Quattrocento* sought to find in this chapter the justification for the absolute "universal man" (the unattainable polymath), Vitruvius's actual text is a lesson in **Roman pragmatism and legal moderation.** Vitruvius argues that the architect's goal is *elemental self-sufficiency*: *"ne quid ex is indigeat "* (that nothing should be foreign or lacking to him). The architect should not be a rival to the painter or the musician, but a valid interlocutor who understands the codes of each craft.

2. Specialized diligence versus spatial synthesis: Vitruvius contrasts *adsiduitas* (the specialist's obsessive and constant dedication to a single thing) with the architect's panoramic vision. The genius of architectural design lies not in fragmentary execution, but in symphonic coordination. The specialist works on the detail; the architect works on the relationship between the details. This distinction is fundamental to your theoretical framework, as it positions architecture as a second-order science or meta-discipline, whose object of study is not isolated matter, but the order that unifies the parts.

3. The Status of *Nobility* in the Arts: The use of the terms nobilitatem *and* laudis *principatum* reflects the Augustan mindset regarding the social status of the intellectual and the artisan. Vitruvius is attempting to elevate the profession of architecture above purely manual (*fabrica*) or servile labor. By demonstrating that the architect operates with the theory of all the arts, he

grants him a rank of intellectual nobility comparable to that of philosophers or high-ranking officials of the Empire, thus justifying why the treatise is dedicated directly to the *Imperator*.

This passage (I, 1, 15) is the epistemological keystone of the entire Book I. Here Vitruvius definitively dismantles the error of Pytheus by introducing a binary Platonic-Aristotelian distinction: the opus the material, empirical and specialized execution and the *ratiocinatio the* theoretical, scientific and universal principle).

Latin text

«15. Igitur in hac re Pytheos errasse videtur quod non animadvertit ex duabus rebus singulas artes esse compositas, ex opere et eius ratiocinatione. Ex his autem unum proprium esse eorum qui singulis rebus sunt exercitati, id est operis effectus, alterum commune cum omnibus doctis, id est rationem, uti medicis et musicis et de venarum rythmo et pedum [motus], at si vulnus mederi aut aegrum eripere de periculo oportuerit, non accedet musicus, sed id opus proprium erit medici. Item in organo non medicus sed musicus modulabitur, ut aures suavem cantionibus recipiant iucunditatem.»

«15. Therefore, in this matter Pythius seems to have erred because he did not observe that the individual arts are composed of two things, from work and its reasoning. Of these, however, one is proper to those who are trained in each thing, that is, the effect of the work, the other is common to all learned men, that is, reasoning, as is the case with physicians and musicians concerning the rhythm of the veins and the movement of the foot. But if it is necessary to heal a wound or rescue a patient from danger, the musician will not come, but that will be the proper work of the physician. Likewise, the organ will be played not by the physician but by the musician, so that the ears may receive pleasure from the songs. »

Critical Translation

"15. Consequently, at this point Pythius's error is evident, for he failed to recognize that all the arts are composed of two factors: the material execution (*opus*) and the theory that underpins it (*ratiocinatio*). Of these two elements, the first — that is, the completion of the physical work (*operis effectus*) —is the exclusive domain of those who have practised a particular discipline; the second — the theory or rational principle (*ratiocinatio*) —is common to all men of

science (*omnibus doctis*). Thus, for example, both physicians and musicians share theoretical knowledge about the rhythm of blood pulses and its analogy with the movement of metric feet; however, if it is necessary to heal a wound or save a sick person from imminent danger, the musician will not come to the rescue, but such a task will be the proper and exclusive work of the physician. " Likewise, it will not be the doctor, but the musician, who will play and perform on the organ, so that the ears may perceive the delight of its melodies.

Exegetical notes

1. The Anatomy of Knowledge: *Opus* versus *Ratiocinatio*: Vitruvius here establishes a division that elevates architecture to the rank of a liberal science. Opus *is blind*; it is the mechanical repetition of the craftsman who knows how to move his hands but does not know *why* the structure works. *Ratiocinatio* is the *logos*, the mathematical matrix that governs the phenomenon physically and formally. The architect's value lies in the fact that, although he shares *ratiocinatio* with other scholars (*commune cum omnibus doctis*), he has the unique ability to project it onto the constructive *opus.*

2. The analogy of the pulse and the cosmic metronome (*de venarum rhythmo et ad pedem motu*) is an exceptional archaeological testimony of the Hellenistic medicine of Herophilus of Alexandria, who measured the body's pulse using water clocks and the metrical feet of Greek poetry and music. Vitruvius illustrates the thesis on Sophia: the physical universe is interconnected. Blood flows through the veins with the same numerical and harmonic law with which a musician composes a measure and with which an architect calculates the distances of the intercolumniations (*modulatio*) of a temple (Book III).

3. The delimitation of the professional field: At the end of the fragment, Vitruvius prioritizes common sense over theoretical utopia. The architect must possess the *ratiocinatio* of acoustics to design the theater (Book V), but when it comes to playing the instrument (*organ*), he takes a step back and yields the position to the practical musician. This distinction is methodologically important: architecture does not devour the other arts; it conceptually assimilates them to create the spatial container where these arts can coexist harmoniously. The physician heals bodies and the musician delights

souls, but it is the architect who builds the hospital and the theater where both operate.

This passage (I, 1, 16) definitively closes the great epistemological introduction on the training of the architect in Book I. Vitruvius culminates here his defense of **synthetic knowledge** by linking astronomy, music and geometry through the laws of cosmic consonance and optics, and then decrees the real goal of the professional: to achieve a **moderate but sufficient knowledge (*mediocriter*)** that allows him to judge with technical authority without needing to be a manual craftsman.

Latin text

Brief context:

Vitruvius criticizes Pythius, the architect of the Temple of Minerva at Priene, who had demanded that the architect have a perfect command of all the sciences. Vitruvius responds that this is impossible and unnecessary: the architect must know the theoretical aspects (*ratiocinatio*) of many disciplines, but the practical execution (opus*) belongs to* the specialists in each field.

«16. Similiter cum astrologis et musicis est disputatio communis de sympathia stellarum et symphoniarum in quadratis et trigonis diatessaron et diapente, a geometris [divisus] qui graece λόγος ὀπτικός appellatur, ceterisque omnibus doctrinis multae res vel omnes communes sunt dumtaxat ad disputandum. Operum vero ingressus, qui manu aut tractationibus ad elegantiam perducuntur, ipsorum sunt qui proprie una arte ad faciendum sunt instituti. Ergo satis abunde videtur fecisse qui ex singulis doctrinis partes et rationes earum mediocriter habet notas eas quae necessariae sunt ad architecturam, uti si quid de his rebus et artibus iudicare et probare opus fuerit ne deficiatur.»

"16. Similarly, astronomers and musicians share discussion of the correspondence between the stars and musical consonances, in squares and trines, and in the intervals of a fourth and a fifth; they share with geometers the theory of sight, which the Greeks call logos optikos. Many matters, or indeed all, are common to the disciplines at the level of theoretical discussion. The practical execution of works, however, brought to refinement by hand and skilled manipulation, belongs to those trained to practise a particular art. It is therefore amply sufficient for the architect to have a moderate knowledge of the parts and

principles of each discipline that are necessary for architecture, so that he is not found wanting when required to judge and approve matters concerning them."

Critical and Hermeneutic Translation

"16. Similarly, there exists a common sphere of debate (*disputatio communis*) between astrologers and musicians regarding the cosmic sympathy of the stars and musical consonances, structured according to the relationships of squares and trigons, and the intervals of fourth (*diatessaron*) and fifth (*diapente*); likewise, the architect shares with geometers the science of vision, which in Greek is called **λόγος ὀπτικός** (*logos optikos* or perspective). In short, in all branches of knowledge, many subjects — if not all — are common to scholars exclusively on the level of theoretical argumentation (*ad disputandum*)." On the contrary, the practical execution of works (*operum vero ingressus*), which are brought to perfection and elegance by the hands and the skilled manipulation, belongs exclusively to those who have been properly trained and instructed in a single manual craft. Consequently, it is to be considered that an architect who possesses a moderate knowledge (*mediocriter) of the principles and parts of each science—those strictly necessary for architecture—is more than adequately fulfilling (satis abunde*) his duty, so that if it were necessary to issue a technical judgment or approve a project governed by these arts, his authority would not be deficient (*ne deficiat*).

Exegetical notes

1. Astrology and Cosmic Aspects: This passage constitutes one of the most fascinating pieces of documentary evidence of Roman architectural Pythagoreanism. Vitruvius equates the musical intervals of a fourth (*diatessaron*, ratio 4:3) and a fifth (*diapente*, ratio 3:2) with the geometric configurations traced by the stars in the firmament when they form squares (square aspect, 90 °) and trines (trine aspect, 120 °). This fact confirms that Vitruvian architectural space is a **resonant microcosm**: temples and theaters are designed imitating the same metric proportions with which God tensions the strings of the heavens and the planets.

2. Logos optikos and architectural perception. The Greek expression λόγος ὀπτικός provides an important conceptual context for the optical adjustments discussed in Books III and IV. Greek geometric perspective taught that the human eye distorts the material line (making it

appear concave or convex). The architect, sharing this *ratiocinatio* with the geometers, does not design for the abstract plane of the paper, but for the retina of the viewer. Architecture intentionally alters the actual geometry (thickening the corner columns or curving the stylobate) so that the *logos optikos* of the eye perceives the building with perfect symmetry and visual stability.

3. The Canon of the Mean (*Mediocriter notes*): Vitruvius coined the definitive concept of the architect's professional training. The word *mediocriter* does not have the modern derogatory sense of "mediocre," but rather the classical sense of Aristotelian *mediocritas*: the golden mean, moderation, and temperance. The excellent architect does not fall into the error of excessive artisanal specialization (*manu tractionibus*); their domain is that of critical intellect. They must possess instrumental knowledge sharp enough to be an infallible judge of the work (*iudicare et probare*) and ensure that no contractor or specialist deceives the state administration. Architecture is, ultimately, the triumph of theoretical oversight over the brute force of the worker.

17. Quibus vero natura tantum tribuit sollertiae, acuminis, memoriae, ut possint geometriam, astrologiam, musicen ceterasque disciplinas penitus habere notas, praetereunt officia architectorum et efficiuntur mathematici. Itaque faciliter contra eas disciplinas disputare possunt, quod pluribus telis disciplinarum sunt armati. Hi autem inveniuntur raro, ut aliquando fuerunt Aristarchus Samius, Philolaus et Archytas Tarentini, Apollonius Pergaeus, Eratosthenes Cyrenaeus, Archimedes et Scopinas ab Syracusis, qui multas res ⟨mechanicas,⟩ organicas, gnomonicas numero naturalibusque rationibus inventas atque explicatas posteris reliquerunt.

"17. Those whom nature has endowed with such skill, intellectual acuity and memory that they thoroughly master geometry, astronomy, music and the other disciplines go beyond the duties of architects and become mathematicians. They can readily discuss these disciplines, armed as they are with many intellectual weapons. Such people are rare: among them were Aristarchus[113] of Samos,

113 Aristarchus of Samos (Ἀρίσταρχος ὁ Σάμιος; c. 310–c. 230 BCE) was a Greek astronomer and mathematician. He is the earliest known proponent of a heliocentric model placing the Sun rather than the Earth at the center of the planetary system. See J. J. O'Connor and E. F. Robertson, 'Aristarchus of Samos', MacTutor History of Mathematics, University of St Andrews.

Philolaus[114] and Archytas[115] of Tarentum, Apollonius[116] of Perga, Eratosthenes of Cyrene, and Archimedes and Scopinas of Syracuse. They left to posterity many mechanical and gnomonic inventions discovered and explained through calculation and the principles of nature."

Critical Translation and Hermeneutics

"17. On the contrary, those beings whom nature has endowed with such skill (*sollertiae*), keenness of mind, and memory that they are capable of assimilating geometry, astronomy, music, and the other liberal arts in a profound and absolute way (*penitus)*, surpass the limits and duties proper to architects (*officia architectorum*) to become pure mathematicians. For this reason, it is extremely easy for them to debate and challenge any of these disciplines, since they are equipped with the vastest arsenal of theoretical projectiles (*pluribus telis disciplinarum*). However, such men appear exceptionally in history, as Aristarchus of Samos, Philolaus and Archytas of Tarentum, Apollonius of Perga, Eratosthenes of Cyrene, Archimedes, and Scopinas of Syracuse once were; colossi who bequeathed to posterity a vast quantity of mechanical devices (*res organicas*) and gnomonic instruments (*gnomonicas*), discovered and rigorously explained through numerical calculation and the physical laws of nature (numero *naturalibusque rationibus*).

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114 Philolaus, also known as Philolaus of Tarentum or of Croton (Greek Φιλόλαος, Philolaos; c. 470–c. 380 BC), was a Greek Pythagorean and Presocratic philosopher, mathematician, astronomer, politician, music theorist and writer. He held that all matter consists of limiting and unlimited things joined by harmony, and that the universe is determined by numbers. He is credited with originating the hypothesis that the Earth was not the center of the universe, a theory included in the Pythagorean astronomical system.

115 Archytas of Tarentum (Greek Ἀρχύτας ὁ Ταραντίνος; c. 430–c. 360 BC) was a philosopher, mathematician, astronomer, statesman, general and contemporary of Plato. He worked in his native city, the Greek colony of Tarentum in Apulia, and belonged to the Pythagorean tradition.

116 Apollonius of Perga, also called Perge (Greek Ἀπολλώνιος; c. 262 BC–Alexandria, c. 190 BC), was a Greek mathematician and astronomer renowned for his work on conic sections. He gave the names ellipse, parabola and hyperbola to the curves now known by those terms. His study of conic sections informed later geometrical problem-solving; it should not be equated uncritically with the symbolic solution of general quadratic equations in modern algebra.

Exegetical Notes

1. **The ontological distinction: Architect versus Mathematician: Vitruvius** defines the boundaries of the profession in relation to pure science. The architect needs theory to order physical matter, but his ultimate goal is the building, the *structure*. The mathematician, on the other hand, operates on a purely intellectual plane; he transcends the need to build because his mind masters the abstract laws that govern the universe. By placing mathematicians above the architect, Vitruvius demonstrates brilliant epistemological honesty: architecture is not the queen of the sciences because it is the most abstract, but because it synthesizes abstract thought for the benefit of civilization.

2. **The pantheon of Hellenistic polymaths:** The names cited constitute the canon of the Hellenistic scientific revolution analyzed here:

- **Aristarchus of Samos: The first to propose the** heliocentric model of the universe.
- **Philolaus and Archytas of Tarentum:** Pythagorean philosophers; Archytas was the father of mathematical mechanics and a friend of Plato.
- **Apollonius of Perga:** The geometer who revolutionized the study of conic sections (ellipse, parabola and hyperbola).
- **Eratosthenes of Cyrene:** The sage who calculated the circumference of the Earth with astonishing accuracy by measuring the shadows at the solstice.
- **Archimedes of Syracuse:** The greatest mechanical and hydrostatic genius of antiquity, inventor of the burning mirrors and the claws that defended Syracuse.
- **Scopinas of Syracuse:** Famous inventor of complex sundials and linear gnomonic mechanisms.

3. **The Duality of the *Organic* and the *Gnonomic:* Vitruvius** closes the chapter by connecting this ending with the books that complete his treatise***:*** the machines of **Book X** (*res organicas*) and the clocks of **Book IX** (*gnomonicas*). By pointing out that these inventions were explained by *numero naturalibusque rationibus*, Vitruvius offers us the interpretive key to his treatise: the machine and the clock are not products of chance or blind craftsmanship; they are the material crystallization of the mathematical laws of nature. The mathematician discovers them in the heavens, and the architect applies them on Earth.

[On Architecture 1.1.18]

18. Cum ergo talia ingenia ab naturali sollertia non passim cunctis gentibus sed paucis viris habere concedatur, officium vero architecti omnibus eruditionibus debeat esse exercitatum, et ratio propter amplitudinem rei permittat non iuxta necessitatem summas sed etiam mediocres scientias habere disciplinarum, peto, Caesar, et a te et ab îs, qui ea volumina sunt lecturi, ut, si quid parum ad regulam artis grammaticae fuerit explicatum, ignoscatur. Namque non uti summus philosophus nec rhetor disertus nec grammaticus summis rationibus artis exercitatus, sed ut architectus his litteris imbutus haec nisus sum scribere. De artis vero potestate quaeque insunt in ea ratiocinationes polliceor, uti spero, his voluminibus non modo aedificantibus sed etiam omnibus sapientibus cum maxima auctoritate me sine dubio praestaturum.

18. Since such gifts of natural ingenuity are granted only to a few people rather than to all peoples everywhere, and since an architect's duties require training in all these branches of knowledge, the breadth of the subject reasonably permits a moderate rather than a supreme command of the disciplines needed for the work. I therefore ask you, Caesar, and those who will read these volumes to forgive anything expressed without strict observance of grammatical rules. I have attempted to write as an architect instructed in these studies, rather than as a great philosopher, an eloquent rhetorician or a grammarian thoroughly trained in the principles of the art. As for the powers of the art itself and the reasoning it involves, I undertake, as I hope, to establish my authority in these volumes beyond doubt, for the benefit of builders and of all learned readers.

This passage (I, 1, 18) represents the absolute epilogue of the first chapter of Book I, an indispensable rhetorical capitulation. Here, Vitruvius executes the captatio benevolentiae *(*request for indulgence) before Octavian Augustus. Aware that his prose does not possess the refinement of a philosopher or a rhetorician, the author asserts his status as an enlightened architect (*architectus his litteris inbutus*) and appeals to imperial clemency regarding possible grammatical liberties, promising in return an unshakeable theoretical and technical competence.

Lecturi means **"those who will read". The** adopted text addresses Augustus and the future readers of the treatise. Roman volumina were commonly papyrus rolls, but their material form does *not justify replacing lecturi with levaturi.*

Likewise, aedificantibus means "**those engaged in building", not "edifiers" in** a moral sense.

Critical and Hermeneutic Translation

"18. Therefore, since the possession of such intellectual gifts and natural ingenuity is not granted indiscriminately to all nations but to a small number of exceptional men, and since the architect's craft must be practised within the full range of liberal arts, the very nature of the discipline — due to its colossal scope (*propter amplitudinem rei*) —allows for the possession not necessarily of the highest degree in these sciences, but rather a moderate knowledge (*mediocres scientias*) of them. For this reason, I beg you, Caesar, both you and all those who will read these volumes (*volumina sunt lecturi*), to forgive me if any passage has been explained in a manner that does not conform to the rules of grammatical composition." I have endeavored to write these pages not in the style of an eminent philosopher, nor of an eloquent rhetorician, nor of a grammarian trained in the subtlest rules of his art, but rigorously like an architect steeped in literature. Nevertheless, with regard to the intrinsic power of the profession (*artis potestate*) and the rational principles that are integrated within it (*ratiocinationes*), I firmly commit myself — or so I hope — to offering in these volumes an unquestionable authority (*maxima auctoritate*), useful not only to builders (*aedificantibus*), but also to all scholars.

Exegetical notes

1. **T**he material form of reading. Roman volumina were commonly papyrus rolls rather than bound codices. This historical context helps explain the material act of reading, but the adopted wording is volumina sunt lecturi, "those who will read these volumes". It neither prescribes a particular movement of the hands nor supports an emendation to levaturi.

2. **The legitimization of technical prose: Vitruvius** here constructs a manifesto in favor of **specialized technical language.** By contrasting his style with that of the *summus philosophus* or the *rhetor disertus*, the author argues that architecture possesses its own syntax. The beauty of his text does not lie in the ornamentation of words (political or literary rhetoric), but in the precision with which the words reflect the *ratiocinatio* of the building. It is a defense of scientific literature: the architect writes as he builds, with solidity (*firmitas*) and structural clarity, renouncing the artifices of sophistical eloquence.

3. The universal scope of the treatise (*Omnibus sapientibus*): The closing paragraph is the argument that unifies the thesis on Sophia. Vitruvius proudly proclaims that his work is not a mere catalog of constructions for masons or laborers (*non modo aedificantibus*). By including the *sapientibus* (the wise, the philosophers, the intellectual elite of the Empire), the treatise claims its place in the high culture of the *Pax Romana*. Vitruvius demonstrates that architecture is a knowledge of the State, a branch of applied philosophy indispensable for the ordering of the civilized world. The emperor governs men, the philosopher governs souls, and the architect builds the material space where both exercise their power.

Chapter 2

Chapter 2 of Book I sets out the six principles of architectural composition. The enumeration at I.2.1 provides the conceptual framework for the definitions that follow.

Latin text

«[1.2.1] Architectura autem constat ex ordinatione, quae graece **τάξις** *dicitur, et ex dispositione, hanc autem Graeci* **διάθεσιν** *vocitant, et eurythmia et symmetria et decore et distributione, quae graece* **οἰκονομία** *dicitur.»*

« [1.2.1] Architecture rests upon Order (*ordinatio*), which the Greeks call **τάξις**; Arrangement (*dispositio*), which they term **διάθεσιν**; and further upon Eurythmy, Symmetry, Propriety (*decor*), and Economy (*distributio*), which in Greek is called **οἰκονομία**. »

Critical and Hermeneutic Translation

Translation note — I.2.1. Vitruvius explicitly gives Greek equivalents for ordinatio (τάξις), dispositio (διάθεσις) and distributio (οἰκονομία). Eurythmia and symmetria are themselves Greek loans incorporated into technical Latin; the passage provides no Greek equivalent for decor here. All six Latin terms are therefore retained and explained in context, without presenting τὸ πρέπον as though it formed part of the text of I.2.1.

Comparative apparatus — I.2.1. Fleury's Budé edition confirms that I.2 forms the core of the general definitions in Book I. Ordinatio/τάξις, dispositio/διάθεσις and distributio/οἰκονομία are retained as technical pairs; eurythmia and symmetria remain technical terms of Greek origin. Decor is not automatically replaced by "decoration": it expresses the suitability or propriety of the work's appearance according to rule, custom and nature.

Architectural and philological note — Dispositio. Ichnographia, orthographia and scaenographia are species dispositionis: graphic ways of conceiving and representing a project. Dispositio should not be reduced to the functional allocation of rooms, since the passage explicitly includes plan, elevation and perspective or scenographic representation.

Comparative critical apparatus — I.2.1–2. The enumeration ordinatio/τάξις, dispositio/διάθεσις, eurythmia, symmetria, decor and distributio/οἰκονομία is stable in its general structure, but I.2.2 presents real differences in the

constitution of the text. The modern critical edition consulted marks [modica] and [commoditas] as doubtful, whereas other editions print them without reservation. The reconstruction of the definition of quantitas also varies: some critical texts introduce <membris>. These differences are not silently harmonized: the base text of the author's manuscript is retained and the alternative recorded in the apparatus.

Textual note — I.2.2. Krohn marks [modica] and [commoditas] as doubtful in the definition of ordinatio. This edition keeps them visibly marked wherever they occur in the adopted critical text and avoids building on them a doctrine dependent on their authenticity. Transmitted wording, editorial deletion, and supplementation are distinct philological categories and must be identified separately.

Terminological note. Ordinatio cannot be equated without qualification with modern "order", nor dispositio with ordinary "arrangement". In this context, ordinatio concerns modulation and the correspondence of parts; dispositio concerns their concrete ordering and the modes of representing the project. The Greek terms τάξις, διάθεσις, ποσότης and ἰδέαι are retained because they contribute to Vitruvius's conceptual precision.

Exegesis Notes

1. **The Ontology of Design: The Verb *Constat*:** Vitruvius does not use the verbs *habere* (to have) or *comprehendere* (to understand). The use of *constat ex* implies that architecture **emerges** and **subsists** only when these six principles coexist simultaneously. If even one of them is missing, the constructed object ceases to be architecture (*architecture*) and degrades to a mere utilitarian building (*fabrica*). This nuance is important: the six principles are not optional tools, but rather the formal and efficient causes of sacred and civil space.

2. **Vitruvius's Greco-Roman biculturalism: It is highly significant** that Vitruvius immediately translated his concepts into Greek (*τάξις*, *διάθεσις*, *οἰκονομία*). This demonstrates that the Latin of the 1st century BC still lacked an abstract vocabulary mature enough for the theory of art. By anchoring his treatise in Hellenistic terminology, Vitruvius sought to endow the new architecture of the Roman Empire with the same philosophical and scientific

dignity that the arts possessed in classical Greece. The Roman architect is not a mere builder; he is the heir to Hellenic *paideia*.

3. **Preliminary conceptual map of the Six Axioms:** For clarity of exposition, it is convenient to set out in synthetic form the order and hierarchy of these six concepts, which Vitruvius defines in the following paragraphs of the chapter:

° **The Ordination (*Ordinatio* / *τάξις*):** The establishment of the mathematical module and the general scale.

° The **Arrangement (*Dispositio* / *διάθεσις*):** The geometric and spatial representation on the plane through the plan, the elevation and the perspective.

° **Eurythmy: The visual and harmonious beauty that the eye perceives *in*** the proportions of the finished work.

° **Symmetry (*Symmetria*):** The regular metric correspondence between the parts and the whole based on a common unit of measurement (the module).

° **The Decorum (*Decor*):** The ethical, social and liturgical suitability of the building according to its function and the divinity to which it is consecrated.

° **Distribution (*Distributio* / *οἰκονομία*):** Economic management, administration of materials and adaptation of the work to the status of the owner.

This fragment (I, 2, 2) is of colossal theoretical density, as it defines the first two axioms of architecture: **Ordination (*Ordinatio*)** and **Arrangement (*Dispositio*)**. Furthermore, it introduces the celebrated triad of architectural representational forms (plan, elevation, and perspective), which constitutes the basis of Western technical drawing.

Latin text

«2. Ordinatio est modica membrorum operis commoditas separatim universeque proportionis ad symmetriam comparatio. Haec componitur ex quantitate, quae graece ποσότης dicitur. Quantitas autem est modulorum ex ipsius operis e singulisque membrorum partibus sumptio universi operis conveniens effectui. Dispositio autem est rerum apta conlocatio elegansque compositionibus effectus operis cum qualitate. Species dispositionis, quae graece dicuntur ἰδέαι, sunt hae:

ichnographia, orthographia, scaenographia. Ichnographia est circini regulaeque modice continens usus, e qua capiuntur formarum in solis arearum descriptiones. Orthographia autem est erecta frontis imago modiceque picta rationibus operis futuri figura. Item scaenographia est frontis et laterum abscedentium adumbratio ad circinique centrum omnium linearum responsus. Hae nascuntur ex cogitatione et inventione. Cogitatio est cura, studii plena et industriae vigilantiaeque, effectus propositi cum voluptate. Inventio autem est quaestionum obscurarum explicatio ratioque novae rei vigore mobili reperta. Hae sunt terminationes dispositionum.»

« 2. Order is the balanced adjustment of the individual members of the work taken separately, and, for the work as a whole, the comparison of the proportion with a view to a symmetrical result. It is composed of quantity, which in Greek is called **ποσότης**. Quantity, in turn, consists in taking the modules from the members of the work itself and, from the several parts of those members, producing the harmonious and fitting effect of the work as a whole. Arrangement, for its part, is the apt placement of the elements and the elegant effect of the work that results from their combinations according to its character. The kinds of arrangement, which in Greek are called **ἰδέαι**, are these: the ground plan[117](ichnographia), the elevation (orthographia), and the perspective (scaenographia). The ground plan is the measured use of compass and rule, by which the outlines of forms are set out upon the surfaces of the sites. The elevation is the upright image of the facade, drawn to scale as a figure of the work to come. Likewise, the perspective is the sketch of the facade together with its receding sides, with all the lines converging upon the center of a circle. These arise from reflection and invention. Reflection is the studious, industrious, and vigilant care devoted to the pleasurable accomplishment of a design. Invention, for its part, is the unravelling of obscure problems and the reasoned discovery of a new principle through a lively agility of mind. Such are the determinations of arrangement.

Critical Translation and Hermeneutics

"2. Order (*ordinatio*) consists of the just proportion (*modica commoditas*) of the members of a work taken separately, and in the comparison of the

117 F. Arq. Delineation of the floor of a building.

proportions of the whole with symmetry (*symmetria*). This is composed of quantity (*quantitas*), which in Greek is called **ποσότης** (*posótes*). Quantity, in turn, is the adoption of modules (*modulorum sumptio*) from the members of the work themselves, as well as the harmonious and convenient effect of the whole of the building derived from each of the parts of said members."

Arrangement (*dispositio*), for its part, is the appropriate placement of elements and the elegant effect of the work resulting from their combinations according to their quality. The forms or categories of arrangement, which in Greek are called **ἰδέαι** (*idéai*), are these three: ichnography (*ichnographia* or plan), orthography (*orthographia* or elevation), and scaenographia (*perspective*).

- Ichnography (the ground plan) is the disciplined and continuous use of rule and compass, by which the outlines of the forms are set out upon the ground plane.
- The **orthography** is the vertical representation of the facade and a figure drawn to scale in a moderate way, reflecting the proportions of the future work.
- Scaenographia, the **perspectival representation is** the sketch of the facade and the sides that recede into the distance, with all vanishing lines converging towards the center of a circle.

These categories arise from meditation (*cogitation*) and invention (*invention*). Meditation is attentive reflection, full of assiduity, industry, and vigilance, which pursues the effect of the devised purpose with intellectual delight. Invention, on the other hand, is the resolution of obscure problems and the discovery of a new constructive principle through agile and vigorous ingenuity. These are the delimitations of the dispositions.

Exegetical Notes

1. **Quantitas as the Birth of the Module:** Vitruvius defines *quantitas* (*ποσότης*) not as an absolute metric dimension *(*meters or fixed feet), but as a **relative and modular dimension (**modulorum *sumptio*). The architect takes a part of the building — for example, the diameter of the column — and that part becomes the module M. All the rest of the temple (height, width of the forum, intercolumniations) will be a multiple or submultiple of that module. Ordering is the abstract order that reduces the complexity of matter to a single generating number.

2. **The restoration of the three *Ideas of* drawing:** Vitruvius uses the Platonic word **ἰδέαι** to refer to the plan, the elevation, and the perspective. This means that for the Roman, technical plans are not mere commercial illustrations; they are the **mental forms or abstract archetypes** that the architect projects onto paper before the building exists in material reality.

- The *ichnographia* (ground plan) is defined by the footprint on the ground (*in solis arearum*).
- The *orthographia* (elevation) is the rigorous orthogonal projection (*erecta frontis imago*).
- Scaenographia is a re*prese*ntation of the front and receding sides, with the lines answering to a center. Its precise geometric interpretation belongs to the history of **the passage's reception; the wording alone does not establish the complete system of Renaissance linear perspective**.

3. **The Psychology of Design: Cogitatio *and* Inventio*:* The closing of the paragraph connects** technical drawing with the architect's mind. Vitruvius details that plans do not arise from nothing; they spring from *cogitatio* (the analytical, obsessive, and vigilant analysis of the site) and inventio *(*the creative spark, the *vigore mobili*, that elegantly resolves the technical problem). He emphasizes that meditation should result in an effect *cum voluptate (with pleasure/delight).* Architectural design is a joyful intellectual act: reason dominating the chaos of spatial limitations.

This fragment (I, 2, 3) defines the third axiom of Vitruvius' treatise*:* Eurythmy**. This** principle shifts the theory of design from the purely numerical or abstract plane to the realm of **visual perception and subjective aesthetics,** establishing that architectural beauty is consummated in the gaze of the spectator (*aspectus*).

To render the Latin as "all things correspond to their own magnitude" is a gross error. In Vitruvius, *symmetria* does not denote *magnitude* (absolute size) but rather modular proportionality—the internal metric correspondence between the parts.

Latin text

«3. Eurythmia est venusta species commodusque in compositionibus membrorum aspectus. Haec efficitur cum membra operis convenientis sunt

altitudinis ad latitudinem, latitudinis ad longitudinem, et ad summam omnia respondent suae symmetriae.»

« 3. Eurythmy is a beautiful appearance and a graceful, becoming aspect in the composition of the members. This is achieved when the members of the work are of a height suited to their width, a width suited to their length, and, in sum, all correspond to their symmetry. »[118]

Critical Translation and Hermeneutics

"3. Eurythmy is the beautiful appearance (*venusta species*) and the proportionate aspect (*commodus aspectus*) in the composition of the building's members. This is achieved when the members of the work maintain a suitable height in relation to their width, a suitable width in relation to their length, and, ultimately, when all the elements **respond harmoniously to their own modular symmetry** (*suae symmetriae*). "

Exegetical Notes

1. The Aesthetics of the Retina: The Weight of *Aspectus*: Unlike *Ordinatio* (which is a cold, mathematical calculation on papyrus), Eurythmy is defined exclusively through visual experience (*aspectus* and *species*). Vitruvius introduces here the psychological component of perception: the building must not only be geometrically exact, but it must also **appear** so to the human eye. Eurythmy is responsible for transforming the rigidity of number into visual grace (*venusta), guaranteeing the* aesthetic delight of the citizen who contemplates the work from street level.

2. modulation (X:Y:Z): Vitruvius defines eurhythmy as a system of proportional correspondences linked in the three dimensions of space. The text establishes a clear design principle: height must be related to width (H→W), width to length (W→L), and this dimensional trinity must ultimately be subject to the general rule of modular symmetry (*suae symmetriae*). This passage is vital to your conceptual framework, as it demonstrates that Roman classicism conceived of space in a volumetric and unitary way, preventing a façade from being designed independently of the depth of the building's body.

118 From the Latin eurythmia. Eurythmia refers to the act of moving in a harmonious way and seeking beauty.

3. The preamble to Optical Corrections: Vitruvius will detail these in Books III and IV (such as the entasis of columns or the inclination of pediments). Since the human eye distorts straight lines due to distance and perspective, the architect is obliged to apply the laws of eurhythmy to correct these illusions. Sometimes, for a temple *to appear* perfectly symmetrical, it is necessary to alter the actual measurements of its elements. Eurythmy, therefore, represents the triumph of optical design over the rigidity of pure geometric rules.

This fragment (I, 2, 4) defines the fourth axiom of classical design: **Symmetry (*Symmetria*)**. This concept, along with the module, is the absolute mathematical core of Roman architecture during the Augustan period.

Latin text

4. Item symmetria est ex ipsius operis membris conveniens consensus ex partibusque separatis ad universae figurae speciem ratae partis responsus. Uti in hominis corpore e cubito, pede, palmo, digito ceterisque particulis symmetros est eurythmiae qualitas, sic est in operum perfectionibus. Et primum in aedibus sacris aut e columnarum crassitudinibus aut triglypho aut etiam embatere, ballista e foramine ⟨capituli⟩, quod Graeci **περίτρητον** *vocitant, navibus interscalmio, quae* **διάπηγμα** *dicitur, item ceterorum operum e membris invenitur symmetriarum ratiocinatio.*

"4. Symmetria is the fitting correspondence among the members of a work and the relationship of its separate parts, measured by a determined unit, to the appearance of the whole. Just as the human body has commensurable relations among forearm, foot, palm, finger and other members, so do completed buildings. In sacred temples the measure is taken from the diameter of a column, a triglyph or an embater; in a ballista, from the opening of its capital, which the Greeks call **peritreton; in ships**, from the spacing between thole-pins, called **dipegma.** In other works too, the system of commensurability is derived from their members."

Critical and Hermeneutic Translation

« 4. Likewise, symmetry (*symmetria*) consists in the convenient consonance (*conveniens consensus*) of the members of a work considered in themselves, and in the correspondence of the separate parts with respect to the appearance of the total configuration, taking as a basis a determined part as a module (*rata pars*).

Just as the human body possesses the eurhythmic quality of symmetry, derived from the forearm, the foot, the palm, the finger, and other smaller parts, the same is true for the perfect execution of buildings. This is evident, first and foremost, in sacred temples, calculated either from the diameter or thickness of the columns (columnarum crassitudinibus), or from the triglyph (triglypho), or from the module (embater); similarly, it is found *in military* ballistics, derived from *the* diameter *of* the *torsion* opening in the capital (*e foramine* capituli), which the Greeks call **περίτρητον** (*perítreton*); and in ships, from the space between the oars, or interscalmus, called **διάπηγμα** (*diapegma*). Similarly, the analytical principle of symmetries (*symmetriarum ratiocinatio*) is discovered in any other type of work by examining its own members.

Comparative critical apparatus — I.2.4. Embatere is adopted and the supplement <capituli> is made visible in ballista e foramine <capituli>, as in Krohn's printed text (1912, 10, lines 18–20). The Greek terms require particular care: περίτρητον denotes the machine's torsion opening. For the naval module associated with interscalmium, the Spanish edition's running text has διάπηγμα, whereas its comparative note gives διπηχυια. Krohn's printed text gives διπηχυαια and Rose (1899, 11, line 17) gives διάπηγμα. the authorial Spanish edition's running reading is retained here, and the disagreement within the Spanish source is recorded rather than silently harmonized; the current Perseus transcription must not be assumed to reproduce every detail of Krohn's Greek.

Conceptual note — Symmetria. Here symmetria means commensurability or the modular correspondence of parts to a whole, rather than bilateral symmetry. The variety of examples—temple, ballista and ship—shows that Vitruvius formulates a principle of relative dimensioning applicable to different technical fields, rather than a single universal proportion.

Exegetical Notes

1. Ancient symmetry **does not mean the same as modern** *symmetry* (a mirror image with respect to an axis). For Vitruvius, symmetry is the *conveniens consensus* (shared mathematical harmony). It is the proportional relationship that unites the parts with the whole. Its operational key is the **rata pars** (the aliquot or fixed part), which acts as the common metric divisor of the entire project. If the module (*rata pars*) measures 50 cm, the columns will measure 10×50 cm, the pediment 6×50 cm, and the forum 40×50 cm.

2. Anthropomorphic Metrological Canon: Vitruvius bases the validity of architectural symmetry on the human body. God or nature has designed the body in such a way that the finger is a fraction of the palm, the palm a fraction of the foot**,** and the foot a fraction of the cubit. Therefore, the classical metric system does not use impersonal abstractions, but **organic and corporeal units**. The building is a reflection of the biological order.

3. The Transdisciplinary Modular Unit: The recovered section confirms that the treatise unifies all engineering disciplines under a single scientific framework. Vitruvius demonstrates that the same mathematical thinking governs three seemingly unrelated fields:

- **Sacred Architecture:** Uses as a *module* the lower diameter of the column (*crassitudo*), the module of the Doric triglyph or the *embatés* (the space of the grid).
- **Military Engineering (Siegecraft):** The ballistae in Book X are not designed "by eye." Their full scale depends on the *foramen* (the hole through which the siege cords pass). The diameter of that hole is the *rata pars*, which determines the size of the entire siege machine.
- **Engineering:** Warships are designed based on the *diapegma* (the interscalm), the fixed distance that must exist between the seat of one rower and the next.

For the High Empire, a temple, a war machine, and a naval vessel are, ontologically, the same **geometric structure applied to different materials**. The architect is the universal sage because he masters that *symmetriarum ratiocinatio* that unifies the world.

This fragment (I, 2, 5) defines the fifth axiom of classical architecture: **Decorum.** This principle introduces the ethical, theological, and semiotic dimension **into architectural design,** decreeing that a building must not only be geometrically perfect and perceptually eurhythmic, but also ***politically*** correct and sacredly appropriate to its function and context.

Latin text

«5. Decor autem est emendatus operis aspectus probatis rebus compositi cum auctoritate. Is perficitur statione, quod graece **θεματισμῷ** *dicitur, seu consuetudine aut natura. Statione, cum Iovi Fulguri et Caelo et Soli et Lunae*

aedificia sub divo hypaethraque constituentur; horum enim deorum et species et effectus in aperto mundo atque lucenti praesentes videmus. Minervae et Marti et Herculi aedes doricae fient; his enim diis propter virtutem sine deliciis aedificia constitui decet. Veneri, Florae, Proserpinae, fontium nymphis corinthio genere constitutae aptas videbuntur habere proprietates, quod his diis propter teneritatem graciliora et florida foliisque et volutis ornata opera facta augere videbuntur iustum decorem. Iunoni, Dianae, Libero Patri ceterisque diis qui eadem sunt similitudine si aedes ionicae construentur, habita erit ratio mediocritatis, quod et ab severo more doricorum et ab teneritate corinthiorum temperabitur earum institutio proprietatis.»

« 5. Decorum, in turn, is the faultless appearance of a work composed, with authority, of approved elements. It is achieved by prescription—which in Greek is called **θεματισμός**, by usage, or by nature. By prescription, when temples to Jupiter the Lightning-bringer, to the Heaven, the Sun, and the Moon are erected in the open air and unroofed (hypaethral); for of these gods we behold the semblance and the active power present before us in the open and resplendent sky. The temples of Minerva, Mars, and Hercules will be made Doric, since to these gods, on account of their valour, it befits that buildings be raised without refinements. For Venus, Flora, Proserpina, the Spring (Fons), and the Water-Nymphs (Lymphae), temples built in the Corinthian manner will be seen to possess fitting qualities, since to these deities, on account of their gentleness, works that are more slender and florid—adorned with leaves and volutes—will seem to enhance their due grace. If temples are made Ionic for Juno, Diana, Father Liber, and the other gods of like nature, a due moderation will be observed, for the establishment of their character will temper both the severe manner of the Doric and the delicacy of the Corinthian.»[119]

Critical Translation and Hermeneutics

" 5. Decorum (*decor*) consists in the irreproachable aspect of a work (*emendatus aspectus*), constituted with authority from approved elements (*probatis rebus*).

119 Vitruvius preserves some of his associations in the section of his work On Architecture in which he describes how the design of a temple (aedes) should reflect the nature of the deity that will be housed in it: The character of the Corinthian order seems most appropriate for Venus, Flora, Proserpina and the nymphs [Lymphae] of the Fountains; for its slenderness, elegance and richness, and its ornamental leaves topped by volutes, seem to bear analogy to their dispositions.

This is achieved through ritual or institutional rules (*statione*), which in Greek are called **θεματισμός** (*thematismós*); through custom (*consuetudo*); or by the requirements of nature itself (*natura*)."

- **According to the ritual rule (*statione*):** it is verified when temples are built for Jupiter Fulgurante, the Sky, the Sun and the Moon in the open air and without a roof (*sub divo hypaethraque*); for we see these gods present themselves, with their own image and active power, in a manifest, open and resplendent world.
- Likewise, for Minerva, Mars and Hercules temples of **the Doric order will be erected** (*aedes doricae*); for these divinities, by virtue of their military strength and virile valour (*virtutem*), are decently entitled to sober buildings devoid of ornamental delights.
- For Venus, Flora, Proserpina and the Nymphs of the Fountains (*Fonti, Lumphis*), temples erected in **the Corinthian order** (*corinthio genere*) will seem to possess the most appropriate qualities; for these deities, due to their delicacy (*teneritatem*), are given a fitting decorum by the use of more slender, flowery and ornamented works with leaves and volutes.
- **Ionic order** (*aedes ionicae*) are built for Juno, Diana, Father Liber (Bacchus), and the other gods who share the same intermediate condition**, the law of just and moderate proportion (***ratio mediocritatis*) will have been observed; since the establishment of their specific features will temper and mediate between the severe custom of the Dorics and the extreme delicacy of the Corinthians.

Exegetical Notes

1. **Philological note on p*robatis rebus*.** The transmitted text and modern critical editions read *probatis* rebus, "approved elements" or "recognized solutions", within the definition of decor. No particular medieval corruption is asserted here without an identified manuscript witness.
2. **Architecture as Theological and Semiotic Anthropomorphism:** This passage constitutes the birth certificate of the theory of **architectural genres or characters. Vitruvius demonstrates that the classical** orders (Doric, Ionic, and Corinthian) are not mere decorative systems interchangeable at whim, but the tectonic transposition of the identity of the god who inhabits the *cella*:

- **The Doric order represents masculine *Virtus*:** Devoid of superfluous ornamentation (*sine deliciis*), it embodies the robust musculature and severity of the soldier. It is the order of war and defensive wisdom (Mars, Minerva, Hercules).
- **The Corinthian is the feminine *Teneritas:*** Slender, ornamented with acanthus leaves and sinuous volutes, it represents the grace and fertility of the young woman (Venus, Flora).
- **The Ionic order is the matronly *Mediocritas*:** The just mean (*ratio mediocritatis*). It is neither as austere as the Doric nor as ornamental as the Corinthian; its volutes imitate the curly hair of the mother of the family or of deities who demand a solemn but balanced worship (Juno, Diana).

3. ***Hypaethra* Architecture and the Cosmos as Temple:** The rule of *statio* explained at the beginning demonstrates the indissoluble link between the gnomonics of Book IX and building typology. Building *hypaethra* (roofless) temples for the Sun, the Moon, or Jupiter is a cosmic imperative. It would be a theoretical affront to enclose, under an artificial wooden roof, the deities whose essence is infinite light and the ray of the firmament (*in aperto mundo atque lucenti*). Roman architecture submits to the laws of physics and the astronomy of the sky; the building breaks its own material boundary to merge with the celestial vault.

This fragment (I, 2, 6) addresses the second dimension of decorum: **Custom (*Consuetudo*)**. Vitruvius momentarily abandons theology to focus on the internal coherence of the building, formulating two universal laws of architecture: **spatial congruence** (the dignified correspondence between the exterior and the interior) and **tectonic orthodoxy** (strict respect for the rules of combining the orders).

The Latin term consuetudinibus *(*meaning **customs/traditions**) and ***ordinis*** (meaning **architectural order, not "** order"). Likewise, *epistyliis* are not "epistles", but **epistyles or architraves**, and *offendetur aspectus* means that **" the viewer's sight will be offended/the gaze will be scandalized "**.

Latin text

«6. Ad consuetudinem autem decor sic exprimitur, cum aedificiis interioribus magnificis item vestibula convenientia et elegantia erunt facta. Si enim interiora prospectus habuerint elegantes, aditus autem humiles et inhonestos, non erunt

cum decore. Item si doricis epistyliis in coronis denticuli sculpentur aut in pulvinatis columnis ex ionicis epistyliis [capitulis] exprimentur triglyphi, translatis ex alia ratione proprietatibus in aliud genus operis offendetur aspectus, aliis ante ordinis consuetudinibus institutus.»

"6. Propriety according to custom is achieved when magnificent interiors are accompanied by fitting and elegant vestibules. If the interiors offer elegant views but the entrances are low and undistinguished, the building will lack propriety. Likewise, if dentils are carved in the cornices of Doric entablatures, or triglyphs are introduced into Ionic entablatures with cushion-capital columns, the transfer of features from one system to another kind of work will offend the eye, because the established conventions of the orders are different."[120]

Critical and Hermeneutic Translation

"6. Furthermore, decorum is expressed according to custom (*consuetudinem*) in the following way: when magnificent residential interiors are accompanied by vestibules (*vestibula*) executed with identical propriety and elegance. Indeed, if the internal rooms offer elegant views but the entrances are low, meager, or indecorous (*humiles et inhonestos*), the work will lack decorum."

Similarly, if dentils (*denticuli*) were carved into the cornices of Doric entablatures, or if triglyphs were sculpted on Ionic architraves attached to columns with *pulvinatis capitals,* a grave offense would be committed. By transferring the specific features of one structural logic to another type of work, **the viewer's sight would be seriously offended** (*offendetur aspectus*), because the traditions and customs previously established for each architectural order (*ordinis consuetudinibus*) would have been violated.

Exegetical Notes

1. The Sociology of Roman Space (The Dialectic of the *Vestibulum*): Vitruvius introduces a principle of distributive coherence linked to social status. In the Rome of the High Empire, the vestibule of the *domus* or palace is not a purely private space; it is the public stage where clients wait daily for the *salutatio* matutina. Designing a luxurious interior preceded by a squalid

120 A triglyph (Greek τρίγλυφος, from τρι-, "three", and γλύφος, "carving" or "groove") is a characteristic architectural ornament of the Doric frieze: a rectangular element in relief, taller than it is wide, with three vertical bands separated by two complete grooves and two half-grooves, one at each end. Sometimes only the central grooves occur.

entrance (*inhonestos) is a political and* aesthetic error. In the present author's reading, the building may be likened to a Ciceronian rhetorical discourse: the exordium (the vestibule) must dignifiedly anticipate the grandeur of the body of the work.

2. **Grammar and Syntax Errors:** Vitruvius defines the architectural orders not as a collection of whimsical ornaments, but as **languages with a grammar and syntax of their own (an interpretive analogy)**.

- The Doric order imitates the primitive structure of wooden beams: the triglyphs represent the ends of the crossbeams. Placing dentils (which belong to the Ionic tradition of light reed roofs) on a Doric cornice is an aberrant structural contradiction.
- Mixing Doric triglyphs with architraves and Ionic columns with pulvinated volute capitals (*pulvinatis*) destroys the veracity of the building.

3. **Sight as Moral Judge (*Offendetur aspectus*):** For the thesis on Sophia, the paragraph's conclusion is providential. Vitruvius points out that the spurious mixture of the orders produces an immediate visual offense: *offendetur aspectus*. This demonstrates that for the Romans, the eye of a cultivated spectator is not passive; it possesses an aesthetic education rooted in custom (*consuetudo*). Seeing a syntactic error in stone provokes the same intellectual rejection as hearing a serious grammatical mistake in a speech in the Forum. Architecture, therefore, is consolidated as a discipline regulated by cultural laws as strict as those of law or rhetoric.

This fragment (I, 2, 7) defines the third and final dimension of decorum: **Nature (*Natura*). With this passage, Vitruvius** masterfully connects the theory of design with **Galenic and** Hippocratic medicine (ancient hygienism) and with astronomy applied to climatic orientation (bioclimatics).

1. ***Fana constituentur*:** *Fanum* in Latin means **" sanctuary ", " sacred precinct " or " temple "** (from which the word "profane" comes).

2. ***Aesculapio Saluti*:** They are not two separate deities called " Aesculapius Salutus ", but **Asclepius (Aesculapius) and Salus (the goddess Hygieia of health)**.

3. ***Hibernaculis ab occidente hiberno*:** These are not " hibernations ", but the **winter rooms** of the Roman house, which must face southwest to take advantage of the afternoon heat.

4. *Neque exclaratur neque obscuratur*: This refers to the fact that the northern light " does not suffer glare or obscuration " from the passage of the sun.

Latin text

«7. Naturalis autem decor sic erit, si primum omnibus templis saluberrimae regiones aquarumque fontes in îs locis idonei eligentur in quibus fana constituantur, deinde maxime Aesculapio, Saluti, ut eorum deorum quorum plurimi medicinis aegri curari videntur. Cum enim ex pestilenti in salubrem locum corpora aegra translata fuerint et e fontibus salubribus aquarum usus subministrabuntur, celerius convalescent. Ita efficietur uti ex natura loci maiores auctasque cum dignitate divinitas excipiat opiniones. Item naturae decor erit, si cubiculis et bybliothecis ab oriente lumina capiuntur, balneis et hibernaculis ab occidente hiberno, pinacothecis et quibus certis luminibus opus est partibus a septentrione, quod ea caeli regio neque exclaratur neque obscuratur solis cursu sed est certa inmutabilis die perpetuo.»

"7. Propriety according to nature is achieved, first, by choosing the healthiest regions and suitable springs of water for the places where sanctuaries are established, especially those of Aesculapius and Salus, through whose healing arts many sick people appear to recover. When the sick are transferred from an unhealthy place to a healthy one and supplied with water from wholesome springs, they recover more quickly. The nature of the place thus enhances the deity's reputation and dignity. Natural propriety also requires bedrooms and libraries to receive light from the east, baths and winter rooms from the winter sunset, and picture galleries and rooms needing steady light from the north, since that quarter is neither brightened nor darkened by the sun's course but remains constant throughout the day."

Critical and Hermeneutic Translation

7. For its part, natural decorum (*naturalis decor*) will be manifested if, above all, the most healthy regions and suitable springs of water are chosen for the foundation of the sanctuaries (*fana) in those locations where the temples* are to be erected; this should be applied especially to **Aesculapius and Salus**, deities whose medical arts seem to heal a great number of sick people. Indeed, when bodies weakened by disease are moved from pestilent places to healthy environments, and are given access to water from wholesome springs, they

recover their health more quickly. In this way, through the influence of the very nature of the place (*ex natura loci*), the deity will receive increased worship and veneration invested with the highest dignity.

Likewise, the decorum of nature will be respected if **bedrooms (*cubiculis*) and libraries receive light from the east**; bathrooms (*balineis*) and winter quarters (*hibernaculis*), from the winter west (west/southwest); and art galleries (*pinacothecis), together with those rooms that require constant illumination, from the* north, since that region of the firmament neither dazzles nor darkens with the course of the sun, but remains fixed, homogeneous, and immutable throughout the day (*die perpetuo*).

Exegetical Notes

1. **Hygienic Urbanism and Medical Theology: Vitruvius** demonstrates that Roman sacred architecture is neither capricious nor purely aesthetic; it is subject to the biological laws of nature. Placing a sanctuary (*fanum*) dedicated to healing deities like Asclepius or Salus in an unhealthy swamp would destroy the god's credibility. If the sick person recovers thanks to the pure air and clean water of the place (*ex natura loci*), they will miraculously attribute their cure to divine intervention, increasing the dignity and political prestige of the state religion. Architecture here acts as a strategic ally of preventive medicine.

2. **Bioclimatic Architecture and Solar Orientation:** This paragraph constitutes the first manual of thermal orientation in Western history. Vitruvius distributes the program of needs of the *domus* following the movement of the sun and the needs of the mind and body:

- **East:** For bedrooms and libraries. The morning light prevents dampness in books and awakens the intellect early.
- **Winter West (Southwest):** For winter bathrooms and lounges (*hibernaculis*). By opening towards the west, these rooms capture the heat accumulated throughout the afternoon, warming the space precisely during the hours when they will be used during the cold months.

3. **The North as the Space of Absolute Light (*Die perpetuo*):** The recommendation to orient art galleries and studios towards the north (*a*

septentrione) is overwhelmingly scientifically sound. Since in the Northern Hemisphere the sun travels through the south, the light entering through north-facing windows is reflected, indirect, diffuse, and constant. Vitruvius points out that this illumination *is neither clear nor obscured* (it suffers neither the glare of midday nor the long shadows of sunset). It is an immutable light (*certa immutabilis*), ideal for painters to work and for viewers to contemplate the true colors of works of art without optical distortions.

Latin text

8. Distributio autem est copiarum locique commoda dispensatio parcaque in operibus sumptus ratione temperatio. Haec ita observabitur, si primum architectus ea non quaeret, quae non poterunt inveniri aut parari nisi magno. Namque non omnibus locis harenae fossiciae nec caementorum nec abietis nec sappinorum nec marmoris copia est, sed aliud alio loco nascitur, quorum comportationes difficiles sunt et sumptuosae. Utendum autem est, ubi non est harena fossicia, fluviatica aut marina lota; inopiae quoque abietis aut sappinorum vitabuntur utendo cupresso, populo, ulmo, pinu; reliquaque his similiter erunt explicanda.

Distributio is the suitable allocation of materials and ground and the prudent, economical control of expenditure. It is observed when the architect does not seek materials that can be obtained only with great difficulty. Pit sand, rubble stone, fir, sappinus timber and marble are not abundant everywhere: different materials occur in different places, and their transport can be difficult and costly. Where pit sand is unavailable, river sand or washed sea sand should be used. A shortage of fir or sappinus can be met by using cypress, poplar, elm, pine and other similar timbers.

Translation notes

8. *Distributio* is the suitable allocation of materials and ground, and the prudent, economical control of expenditure on the works.

This will be correctly observed if, in the first place, the architect does not seek what cannot be found or prepared except with great effort. For not everywhere is quarry sand, rubble stone, fir, sappinus timber, or marble abundant; rather, each material grows in a different place, and its transport is difficult and costly. Therefore, where quarry sand is unavailable, washed river or sea sand will be

used; and in case of a shortage of fir or sappinus timber, it will be supplied with cypress, poplar, elm, pine, and other similar woods.

- **"parcaque in operibus sumptus cum ratione temperatio"**: It is translated somewhat vaguely. The expression emphasizes **prudent economic control** (parcaque + cum ratione).

Distributio autem est copiarum locique commoda dispensatio parcaque in operibus sumptus cum ratione temperatio.

Distribution, however, is the convenient dispensation of resources and places, and the economical and rational adjustment of expenditure in works.

Distributio is the suitable allocation of materials and ground, and the prudent, economical control of expenditure on the works.

Latin text

***9.** Alter gradus erit distributionis, cum ad usum patrum familiarum et ad pecuniae copiam aut ad eloquentiae dignitatem aedificia apte disponentur. Namque aliter urbanas domos oportere constitui videtur, aliter quibus ex possessionibus rusticis influunt fructus, non item feneratoribus, aliter beatis et delicatis, potentibus vero, quorum cogitationibus respublica gubernatur, ad usum conlocabuntur; et omnino faciendae sunt aptae omnibus personis aedificiorum distributiones.*

"9. A second aspect of distributio concerns arranging buildings to suit the needs of householders, their financial resources and the standing associated with eloquence. Town houses call for one arrangement, the houses of those who receive produce from rural estates for another; moneylenders require another, the wealthy and refined another, and those whose deliberations govern the commonwealth another. The arrangement of buildings must, in every case, suit the people for whom they are intended."

Academic translation

9. The second aspect of *distributio* consists in arranging buildings according to the use for which they are intended: for the needs of heads of households, for financial means, or for the dignity befitting eloquence.

It does not seem that urban houses should be built in the same way as those from which the fruits of rural estates are derived; nor in the same way for moneylenders, nor for those who live in luxury and refinement, nor for

powerful men whose intelligence governs public affairs. In short, the layout of buildings should always be suited to the character and condition of each person.

9. The second aspect of *distributio* consists in arranging buildings according to their intended use: for the needs of families, according to economic means, or according to social standing. For it seems that urban houses should be built one way, the houses of those who receive produce from rural estates another, the houses of moneylenders another, those of the wealthy and refined yet another, and those of the powerful, whose intelligence governs the republic, yet still another. Ultimately, the layout of buildings should always be suited to each person's station in life.

Critical Apparatus

1.2.9

Textual note — I.2.9. The adopted text follows the reference reading used in this edition: et ad pecuniae copiam, aedificia apte disponentur and the rest of the sequence as printed in Krohn. Generic manuscript attributions and variants from early editions are not retained here unless checked directly in an identifiable critical apparatus.

Distributionis] Genitive of distributio: the passage introduces its second aspect, the arrangement of buildings for different uses.

Aedificia apte disponentur] "Buildings will be suitably arranged". The adopted phrase concerns planning for intended use and the occupants' circumstances.

Patrum familiarum] "Heads of households" or "householders". The wording belongs to the comparison of buildings appropriate to different owners.

Pecuniae copiam] "Available financial means". The genitive pecuniae depends on copiam in the adopted text.

Eloquentiae dignitatem] "The standing or dignity of eloquence". It characterizes the needs of advocates in the passage's social comparison.

Constitui videtur] "It appears to be determined". The adopted construction forms part of the conclusion on distribution.

Influunt] "Flow in". The term describes the public business and consultations that come to the houses of leading citizens.

Feneratoribus] "Moneylenders". The term identifies one of the occupations whose needs govern the arrangement of a house.

Beatis et delicatis] "The wealthy and those accustomed to luxury". The phrase belongs to the differentiation of domestic requirements.

Potentibus vero] "For the powerful, however". Vitruvius contrasts their public responsibilities with other domestic uses.

Res publica] "Public affairs" or "the state", according to context. Joined or separate spelling does not establish a different architectural prescription.

English Translation

9. The second aspect of *distributio* consists in arranging buildings according to their intended use: for the needs of families, according to economic means, or according to social standing. For it seems that urban houses should be built one way, the houses of those who receive produce from rural estates another, the houses of moneylenders differently, those of the wealthy and refined in yet another way, and those of the powerful, whose intelligence governs the republic, in a different manner. In short, the layout of buildings should always be appropriate to the condition and rank of each person.

Notes and Commentary

- **"alter gradus erit distributionis"**: Vitruvius presents *distributio* on two levels: the first economic and practical (1.2.8), and this second, sociological and functional according to the status of the owner.
- **"eloquentiae dignitatem"**: This refers to the dignity required by people of high social or political rank who need suitable spaces to exert their influence and receive visitors (clients, ambassadors, etc.).
- **"potentibus vero, quorum cogitationibus res publica gubernatur"**: Clear reference to the *optimates* or high-level Roman magistrates. It is one of the few passages where Vitruvius directly alludes to the Augustan political context.

Comparative critical apparatus — I.2.5–9. In decor the critical tradition retains statione/θεματισμῷ, consuetudine and natura as three routes to propriety; the passage does not justify reducing decor to "ornament". In distributio, οἰκονομία encompasses both the management of resources and costs and the suitability of a building to its owner's use, means and rank. Textual variants, semantic explanation and subsequent reception are thus distinguished, avoiding direct

equivalence between Vitruvian categories and contemporary design terminology.

Chapter 3

Latin text

1.3.1 *Partes ipsius architecturae sunt tres: aedificatio, gnomonice, machinatio. Aedificatio autem divisa est bipertito, e quibus una est moenium et communium operum in publicis locis conlocatio, altera est privatorum aedificiorum explicatio. Publicorum autem distributiones sunt tres, e quibus est una defensionis, altera religionis, tertia opportunitatis. Defensionis est murorum turriumque et portarum ratio ad hostium impetus perpetuo repellendos excogitata; religionis deorum inmortalium fanorum aediumque sacrarum conlocatio; opportunitatis communium locorum ad usum publicum dispositio, uti portus, fora, porticus, balinea, theatra, ambulationes ceteraque quae isdem rationibus in publicis locis designantur.*

1.3.1 The parts of architecture proper are three: construction, the making of sundials, and mechanics. Construction, in turn, is divided into two branches: the first is the laying-out of city walls and of works for common use in public places, the second the raising of private buildings. Public works admit of three classes: the first concerns defense, the second religion, and the third convenience. To defense belongs the design of walls, towers, and gates, devised to repel the assaults of enemies in perpetuity; to religion, the placing of shrines and sacred temples to the immortal gods; to convenience, the provision of common spaces for public use—such as harbors, fora, colonnades, baths, theaters, promenades, and the other works laid out on the same principles in public places.

Academic translation

1.3.1 The parts of architecture proper are three: construction (*aedificatio*), gnomonics (gnomonice*)*, and mechanics (machinatio*)*. Construction, in turn, is divided into two sections: one consists of the erection of walls and common works in public spaces; the other is the arrangement of private buildings. For public works, there are three categories: the first is for defense; the second, for religion; the third, for convenience. Defense comprises the theory and design of walls, towers, and gates, conceived to perpetually repel enemy assaults; religion

encompasses the placement of sanctuaries and sacred temples of the immortal gods; Convenience consists in the organization of common places for public use, such as ports, forums, porticoes, baths, theaters, covered walkways and other constructions that are planned with similar criteria on public land.

Philological and Exegetical Apparatus

Textual note — I.3.1. The Latin text is checked against Rose and Krohn. This edition does not seek to establish a new recensio; its observations are therefore confined to problems affecting translation or interpretation and avoid unverified manuscript attributions.

Terminological note — I.3.1. Aedificatio, gnomonice and machinatio are the three parts of architectura according to this chapter. Machinatio denotes the theory and practice of machines; gnomonice, astronomical and time measurement by shadows. Machinatio should not automatically be translated as "engineering", nor gnomonice as "astronomy", since both equivalents enlarge the scope of the ancient terms.

1. Marcus Vitruvius Pollio, De *architectura* 1.3.1. For the fixation of the Latin text, compare the archetypal edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 11-12; and the critical reading of Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 12.

• ***machinatio: The traditional translation of "*** engineering " is amended to **" mechanical"**. In the context of the 1st century BC, machinatio *strictly* refers to the science of machines (both civil traction and military poliorctics), differentiating itself from the contemporary and institutionalized meaning of general engineering.

• ***explicatio:*** The term is more precisely cast as **"layout "** or "deployment" of private buildings, surpassing the flat translation of "realization." Vitruvius alludes to the planned development of domestic and residential space.

• ***Opportunitas: The Vitruvian concept of*** **"opportunity" or "convenience"** is restored in contrast to the modern utilitarianism implicit in "public utility. " *Opportunitas* is the suitability and functional benefit of space for the development of civic life and the leisure of citizens.

• ***fanorum aediumque sacrarum:*** The translation precisely distinguishes between the two terms. Fanum *designates* the sacred enclosure or

consecrated area (sanctuary), while *aedes sacra* constitutes the building or structure of the temple itself.

• ***Inambulations: This*** is technically translated as **"covered walkways"** (or ambulatories). These are not simple walks or strolls in the open air, but specific architectural typologies (such as freestanding porticoes or galleries) designed for exercise and social conversation protected from the weather.

1.3.1 The parts of architecture proper are three: construction, gnomonics, and mechanics. Construction is divided into two sections: public works and the arrangement of private buildings. Public works, in turn, have three distributions: defense, religion, and convenience (Vitruvius, *De architectura* 1.3.1).

Latin text

2. *Haec autem ita fieri debent, ut habeatur ratio firmitatis, utilitatis, venustatis. Firmitatis erit habita ratio, cum fuerit fundamentorum ad solidum depressio, quaque e materia, copiarum sine avaritia diligens electio; utilitatis autem, ⟨cum fuerit⟩ emendata et sine inpeditione usus locorum dispositio et ad regiones sui cuiusque generis apta et commoda distributio; venustatis vero, cum fuerit operis species grata et elegans membrorumque commensus iustas habeat symmetriarum ratiocinationes.*

Academic translation

1.3.2 These constructions must be achieved in such a way that solidity (*firmitas*), utility (*utilitas*), and beauty (*venustas*) are taken into account. Solidity will have been considered when the excavation of the foundations is deepened to firm ground (*solidum*) and when a diligent selection of materials is made from among those available, without sparing any expense (*sine avaritia*); utility, when the arrangement of the spaces is impeccable and presents no impediments to their use, and when the distribution of each type of building is suitable, comfortable, and properly oriented to its region; and beauty, when the appearance of the work is pleasing and elegant, and when the proportion of the members maintains a just calculation of symmetries (*symmetriarum ratiocinationes*).

Comparative note — Bk. 1.3.2 (firmitas · utilitas · venustas). The canonical triad of a building's qualities. The major editions render it

with telling nuances: Granger (Loeb, 1931), 'durability, convenience, and beauty'; Rowland and Howe (Cambridge, 1999), 'soundness, utility, and attractiveness', stressing the functional sense; Gros (Budé) analyses its Hellenistic roots and its relation to the categories of technē; Corso & Romano (Einaudi) expand the historical commentary. In English, Sir Henry Wotton's paraphrase became famous: 'Commoditie, Firmenes, and Delight' (1624). This edition keeps the Latin terms in italics for their conceptual value. [Architectural-historical note: the triad epitomizes Roman building practice—firm foundation, useful distribution, proportionate ornament—and becomes, from Alberti onward, the theoretical framework of Western architecture.]

Philological and Exegetical Apparatus

Textual note — I.3.2. The text is checked against Rose and Krohn. The adopted reading retains emendata et sine inpeditione usus locorum dispositio and apta et commoda distributio. This edition reproduces minor variants only when they affect the translated meaning.

1. Marcus Vitruvius Pollio, *De architectura* 1.3.2. For the textual fixation, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 12; and the revision of Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 12.

- ***habeatur ratio:*** It is translated with greater academic precision as " **take into account"** or "attend to", maintaining the structure of the technical conditional of the treatise.
- ad solidum depressio: the foundations are to be excavated down to firm bearing ground. Solidum denotes a sufficiently stable stratum; it does not require bedrock in every case. The passage concerns the support of the foundations, not the sinking of a finished building.
- **Diligent selection of resources without avarice. The Latin excludes avaricious parsimony in the procurement of resources.**It alludes to the sources of resources or supplies of materials available in the area. The expression sine avaritia means literally "without stinginess" or "without parsimony", implying that a poorly understood economy harms the structure.

- ***emendata... sine impeditione:*** This is technically translated as " **impeccable and without impediments"**. The term *emendata suggests a plan that is corrected, refined*, and free of design flaws.
- ***ad regiones... distributio:*** Vitruvius refers not only to the "category " of the building, but also to its climatic and geographical orientation. The *regions* in this passage are the cardinal points and the zones of the sky (sun exposure and prevailing winds).
- ***membrorumque commensus:*** This translates as **"the proportion of the members"** (or architectural elements). *Commensus* is the mutual metric correspondence between the parts and the whole.
- ***symmetriarum ratiocinationes:*** The term *symmetria* in the classical world *does* not equate to the modern concept of bilateral mirror reflection. It means **"modular relation"**. It is therefore translated as "the just calculation of symmetries ", that is, mathematical modulation based on a control member (the diameter of a column, for example).

1.3.2 These constructions must be achieved in such a way as to attend to solidity, utility, and beauty. Solidity will be ensured by deepening the foundations to the firm stratum and by diligently choosing the materials without sparing any expense; utility, when the arrangement of the spaces presents no impediment and their distribution is comfortable and suitable for each type of building; and beauty, when the appearance of the work is pleasing and the proportion of its members maintains a just calculation of symmetries (Vitruvius, *De architectura* 1.3.2).

Comparative apparatus — I.3.1–2. Aedificatio, gnomonice and machinatio are operational divisions of the discipline; firmitas, utilitas and venustas are criteria Vitruvius requires of the works described. The triad is translated without turning it into a modern slogan: firmitas includes foundations and the choice of materials; utilitas, arrangement suited to use; venustas, a pleasing appearance and proportional relationships.

Reception note — Firmitas, utilitas and venustas. The triad's exceptional subsequent influence should not be projected back on to the lemma. In I.3.2 the three terms occur within a concrete explanation of how works should be executed; their canonisation as a universal formula belongs to the history of reception.

Comparative critical apparatus — I.3.1–2. The text is compared with Krohn (1912) and Philippe Fleury's Budé edition of Book I. The supplement <cum fuerit> before emendata in I.3.2 is explicitly marked in Krohn's printed text (1912, 13, line 7), whose apparatus attributes its addition to Marini. Rose (1899, 14, line 9) prints cum emendata. The Spanish note's claim that Krohn does not mark the supplement in the same way is corrected on this documentary basis. The celebrated triad firmitas–utilitas–venustas is retained in Latin in the commentary to prevent "solidity–function–beauty" from retrospectively becoming a modern theory of functionalism.

Note on scope — I.3.2. Firmitas, utilitas and venustas are criteria Vitruvius formulates for these works within the argument of I.3. Their subsequent reception made them an emblematic triad of architectural theory. This edition avoids automatically extending them into an exhaustive definition of all architecture or assigning them a philosophical genealogy that the passage does not specify.

Chapter 4

Latin text

1.4.1 *In ipsis vero moenibus ea erunt principia. Primum electio loci saluberrimi. Is autem erit excelsus et non nebulosus, non pruinosus regionesque caeli spectans neque aestuosas neque frigidas sed temperatas, deinde si vitabitur palustris vicinitas. Cum enim aurae matutinae cum sole oriente ad oppidum pervenient et his ortae nebulae adiungentur spiritusque bestiarum palustrium venenatos cum nebula mixtos in habitatorum corpora flatu spargent, efficient locum pestilentem. Item si secundum mare erunt moenia spectabuntque ad meridiem aut occidentem non erunt salubria, quod per aestatem caelum meridianum sole exoriente calescit, meridie ardet, item quod spectat ad occidentem, sole exorto tepescit, meridie calet, vespere fervet.*

1.4.1 But for the city walls themselves the governing principles will be these. First comes the choice of a thoroughly healthy site: one that is elevated, free from mist and frost, facing quarters of the sky that are neither sweltering nor cold but temperate, and, further, removed from the neighborhood of marshes. For when the morning breezes reach the town at sunrise, bringing with them the mists that have gathered and, mingled with those mists, the poisonous exhalations of the marsh creatures, and scatter them by their breath into the bodies of the inhabitants, they render the place pestilential. Likewise, walls set along the coast and facing south or west will be unhealthy; for in summer the southern sky grows warm at sunrise and burns at midday, while a westward aspect grows warm at sunrise, is hot at midday, and blazes in the evening. [121]

Academic translation

1.4.1 As regards the configuration of the walls themselves, the fundamental principles will be the following. First, the choice of a highly healthy site. This should be elevated, free from fog and frost, and oriented towards regions of the sky that are neither hot nor cold, but temperate. Likewise, the proximity of marshy lands should be avoided. For when the morning breezes reach the city at sunrise, bringing with them the fogs that rise from there, and the breath of

121 This explanation belongs to ancient environmental medicine: Vitruvius links mist, marshes, exhalations and disease. The note preserves that historical reasoning without recasting it as knowledge of microorganisms.

marsh vermin disperses its poisonous exhalations mingled with the mist over the bodies of the inhabitants, they will make the place a pestilent zone. Similarly, if the walls are situated by the sea and face south or west, they will not be healthy; Since during the summer, the southern region of the sky heats up with the sunrise and burns at midday; meanwhile, the area facing west grows warm at dawn, heats up at midday and scorches at sunset.

Critical Notes

1. Marcus Vitruvius Pollio, De *architectura* 1.4.1. For the fixation and variants of the Latin text, see the critical edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 12-13; and Fritz Krohn's edition, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 12-13.

- ***Chapter 4:*** The old title is corrected to the modern standardized nomenclature **1.4.1** (Book I, Chapter 4, Paragraph 1) to ensure unified indexing in the reference apparatus.
- ***moenibus:*** Although a literal version translates "in the walls themselves", in this context *moenia* does not refer only to the physical structure of the stone wall, but to the **walled enclosure** or the fortified urban perimeter that delimits the foundation of the city.
- ***spiritusque bestiarum palustrium:*** "The spirits of the swamp beasts." Philologically, *spiritus* should be translated here as " **breath**, " **"emanations,"** or "exhalations." Vitruvius operates under the ancient medical theory of miasmas (corrupt air currents that transmit diseases), so the allusion to *bestiae* refers to the harmful insects and microorganisms of stagnant waters.
- ***Cum nebula mixtos.*** Nebula is adopted as the form transmitted in the reference critical text. The form neula is a modern transcription error and is not attributed to a medieval witness.
- ***vespere fervet: The precision*** of Vitruvian thermal gradation is increased. The text describes a progressive increase in heat in the west orientation: *tepescit* (warms), *calet* (warms) and *fervet* (boils, or scorches). Translating *fervet* simply as "hot in the afternoon" distorts the author's emphasis on the suffocating effect of the west orientation.

1.4.1 Regarding the configuration of the walls, the first principle will be the choice of a highly healthy site: elevated, free from fog, and facing temperate regions, avoiding the proximity of marshes whose exhalations pollute the air.

Likewise, walls situated by the sea should not face south or west, due to the excessive heat they suffer from midday until sunset (Vitruvius, *De architectura* 1.4.1).

Latin text

1.4.2 *Igitur mutationibus caloris et refrigerationis corpora quae in his locis sunt vitiantur. Hoc autem licet animadvertere etiam ex îs quae non sunt animalia. In cellis enim vinariis tectis lumina nemo capit a meridie nec ab occidente sed a septentrione, quod ea regio nullo tempore mutationes recipit sed est firma perpetuo et inmutabilis. Ideo etiam ea granaria quae ad solis cursum spectant bonitatem cito mutant, obsoniaque et poma quae non in ea parte caeli ponuntur quae est aversa a solis cursu, non diu servantur.*

1.4.2 Therefore, the bodies that are in these places are spoiled by changes in heat and cooling. This may be observed even from those that are not animals. For in roofed wine cellars no one receives light from the south or from the west, but from the north, because that region at no time receives changes, but is permanently fixed and unchangeable. Therefore also those granaries that look towards the course of the sun quickly change their quality, and food and fruits that are not placed in that part of the sky that is turned away from the course of the sun are not preserved for long.

Academic translation

1.4.2 Therefore, due to the variations of heat and cooling, bodies in these places suffer serious damage. This same principle can be observed even in inanimate objects. In covered wine cellars, for example, no one opens windows facing south or west, but rather north, since that region of the sky never experiences abrupt changes, but remains perpetually constant and unchanging. For this same reason, barns facing the sun's path quickly deteriorate the quality of their crops; and perishable foods and fruits do not keep for long unless placed in that part of the sky sheltered from the sun's path.

Philological and Exegetical Apparatus)

1. Marcus Vitruvius Pollio, *De architectura* 1.4.2. For the textual fixation, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 13; and the revision of Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 13.

- ***ex is quae non sunt animalia:*** A literal rendering would be: "because they are not animals." It is amended to the correct logical category in Spanish: " **in inanimate objects"** or "in things that do not have life," since Vitruvius establishes a methodological contrast between the living organisms studied in 1.4.1 and the inert matter of this paragraph.
- lumina nemo capit: in this architectural context, lumina capere means to provide or take openings for natural light. The wine rooms take their light from the north rather than the south or west. The expression does not describe a person's ability to see.
- *bonitatem cito mutant:* The syntactic calque "they quickly change in freshness" is corrected. The term bonitas in the classic agricultural context refers to the quality, organoleptic properties, or optimal state of preservation of the grain. An incorrect solar orientation accelerates fermentation and the proliferation of pests.
- ***obsoniaque:*** Error of omission that left the Latinized term as "obsoni". *Obsonium* (from the Greek ὄψον) generally designates **perishable foods**, provisions of meats or fish that accompanied the daily bread and that required cold environments for their preservation.

1.4.2 Heat and cold alterations damage not only living organisms but also inanimate matter. Proof of this is that cellar windows are always oriented to the north to avoid thermal variations. Likewise, granaries exposed to the sun quickly spoil crops, and perishable foods (*obsonia*) along with fruits rot if they are not stored in the shade from the sun's rays (Vitruvius, *De architectura* 1.4.2).

Latin text

1.4.3 *Nam semper calor cum excoquit e rebus firmitatem et vaporibus fervidis eripit exsugendo naturales virtutes, dissolvit eas et fervore mollescentes efficit inbecillas. Ut etiam in ferro animadvertimus, quod quamvis natura sit durum, in fornacibus ab ignis vapore percalefactum ita mollescit uti in omne genus formae faciliter fabricetur, et idem cum molle et candens refrigeretur, tinctum frigida redurescit et restituitur in antiquam proprietatem.*

1.4.3 For heat bakes the moisture out of all things and, snatching it away in rising vapors, deprives them of their natural strength; it dissolves them and, melting them by its warmth, renders them weak and soft. As we also observe in

iron, that although it is hard by nature, when heated in furnaces by the vapors of fire it softens so much that it can be easily fashioned into every kind of form, and the same thing, when cooled while soft and red-hot, hardens when cold and is restored to its former properties.

Academic translation

1.4.3 For heat, by completely consuming the firmness of things and stripping away their natural qualities by evaporating their essential liquids, dissolves bodies and, by softening them through the action of fire, weakens them. We can observe this same thing in iron: although hard by nature, when heated to the maximum in furnaces by the emanations of fire, it softens to such an extent that it can be easily forged into any kind of shape; however, that same iron, being soft and red-hot, if cooled abruptly by being immersed in cold water, hardens again and is restored to its original properties.

Critical Notes (Philological and Exegetical Apparatus)

1. Marcus Vitruvius Pollio, De *architectura* 1.4.3. For the textual fixation, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 13; and Fritz Krohn's review, Vitruvii *De architectura libri decem* (Leipzig: Teubner, 1912), 13.

- ***calor cum excoquit:*** A literal translation poured in a somewhat crude way, "when firmness boils over." The verb *excoquere* means **"to consume by cooking, "** "to dry out," or "to extract the juices by means of heat." Vitruvius refers to the physical process by which excessive heat dehydrates materials and breaks their internal cohesion.
- ***vaporibus fervidis eripit exsurgendo:*** Not, as in some renderings, "rescues natural virtues by rising with vapors." Philologically, *eripere* means **"to snatch away" or** "to deprive of," and *exsurgendo* (a gerund indicating the action of rising) describes the **process** of **evaporation**. The hot vapors do not "rescue" the virtues, but rather extract and dissipate them into the air.
- ***natural virtues: It*** is preferably translated as **"natural qualities" or** " intrinsic properties ", avoiding the moral charge of the word "virtues" in contemporary Spanish when talking about physics of materials.

• tinctum frigida redurescit: heated iron hardens again when immersed in cold water; aqua is understood with frigida. Vitruvius uses this example to contrast the effects of heating and cooling. The translation does not substitute steel for ferrum or attribute a modern account of crystalline structure to the ancient text.

1.4.3 Heat dissolves the firmness of bodies by evaporating their natural qualities and weakening their structure. The clearest example is iron: although it is hard by nature, the fire of the furnace softens it so much that it can be forged into any shape; however, if this red-hot, softened metal is immersed in cold water to temper it, it hardens immediately and recovers its original rigidity (Vitruvius, *De architectura* 1.4.3).

Latin text

1.4.4 Licet etiam considerare haec ita esse ex eo quod aestate non solum in pestilentibus locis sed etiam in salubribus omnia corpora calore fiant inbecilla, et per hiemem etiam quae pestilentissimae sint regiones efficiantur salubres. Ideo quod a refrigerationibus solidantur. non minus etiam quae ab frigidis regionibus corpora traducuntur in calidas, non possunt durare sed dissolvuntur, quae autem ex calidis locis sub septentrionum regiones frigidas, non modo non laborant inmutatione loci valetudinibus sed etiam confirmantur.

1.4.4 It is also possible to consider that this is so from the fact that in summer, not only in pestilent places but also in healthy ones, all bodies become weak from the heat, and during winter even the most pestilent regions become healthy. For this reason, when bodies are transferred from cold to warm ones, they cannot last but are dissolved, but those which come from warm places to cold regions of the north, not only do not suffer from the change of place, but are even strengthened.

Academic translation

1.4.4 The truth of these principles can also be seen in the fact that in summer, not only in pestilent areas but even in healthy places, all organisms are weakened by the heat; on the other hand, during the winter, even the most unhealthy regions become healthy. This is because, when bodies acclimatized to the cold move to warm regions, they cannot withstand the change and become unbalanced; conversely, those organisms that migrate from warm areas to the

cold northern regions not only do not suffer health problems from the change of location, but even become stronger.

Philological and Exegetical Apparatus

1. Marcus Vitruvius Pollio, De *architectura* 1.4.4. For the fixation of the Latin text and the restitution of the causal link *cum*, see the critical edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 13-14; and Fritz Krohn's edition, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 13-14.

- ***corpora:*** Although it is literally translated as "the bodies", in this biological and hygienist context it is more appropriate to translate it as **"the organisms"** or "the living beings", since Vitruvius analyses the physiological responses of humans and animals to the environment.
- ***a refrigerationibus... in calidas:*** The broken syntax of the original is amended ("because the bodies are transferred from the cold to the warm "). The Latin text describes an abrupt change of state: organisms shaped by the cold (a *refrigerationibus*) that are moved or exposed to warm zones (*in calidas [regions]*).
- ***non possunt durare sed dissolvuntur:*** A literal translation would In a flat way, "they cannot last but dissolve." In ancient medicine of the Galenic and Hippocratic tradition, " dissolve " *implies* that the humours of the body become unbalanced, lose their natural tension (*tones*) and dilate due to heat, which is technically translated in Spanish as **"they become decompensated**, " **"they weaken," or "they suffer a** physical collapse."
- ***non laborant inmutatione loci valetudinibus:*** The grammatical confusion of a literal version ("they do not suffer the change in the health of the place") is corrected. The verb *laborare* with the ablative *inmutatione* means "to suffer because of the change," and *valetudinibus* (in the affective or conditional plural) refers to the physical state. The correct translation is **"they do not suffer disorders in their health due to the change of place**. "

1.4.4 Climatic evidence confirms these facts: in summer, the heat weakens organisms even in healthy areas, while in winter, unhealthy regions stabilize. The cause lies in the humoral balance of the body: bodies accustomed to the cold collapse when moved to warm climates, while those that migrate from warm

areas to the northern cold not only do not become ill from the change of settlement, but their health is strengthened (Vitruvius, *De architectura* 1.4.4).

This paragraph uses the Greek term στοιχεῖα, "elements" or "constituent principles". Its translation reflects the elementary physics of antiquity. A damaged modern transcription is not, by itself, evidence of corruption in a medieval manuscript.

Latin text

1.4.5 *Quare cavendum esse videtur in moenibus conlocandis ab îs regionibus quae caloribus flatus ad corpora hominum possunt spargere. Namque e principiis, quae Graeci στοιχεῖα appellant, ut omnia corpora sunt composita, id est e calore et umore, terreno et aere, et ita mixtionibus naturali temperatura figurantur omnium animalium in mundo generatim qualitates.*

1.4.5 Therefore, it seems that one must be careful in placing walls away from those regions that can spread hot winds to human bodies. For just as all bodies are composed of the principles that the Greeks call stoicheia, that is, of heat and moisture, of earth and air, so the qualities of all animals in the world are generally formed by natural mixtures of temperature. [122]

Academic translation

1.4.5 Therefore, it becomes evident that in establishing the walled enclosure, exposure to those regions of the sky that could project gusts of hot wind upon the bodies of men must be avoided. For since all bodies are composed of the fundamental principles that the Greeks call elements (*στοιχεῖα*) — that is: by heat, moisture, earth, and air — it is through their various mixtures and their natural equilibrium that the qualities of all living beings in the world are configured, according to their kind.

Philological and Exegetical Apparatus

1. Marcus Vitruvius Pollio, De *architectura* 1.4.5. For the amendment of the corrupt Greek term and the fixation of the Latin text, see the archetypal edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner,

122 Στοιχεῖα (stoicheia) here means "elements" or "constituent principles". Vitruvius enumerates heat, moisture, the earthy component and air within an ancient physical theory; these are not chemical elements in the modern sense.

1899), 14; and the critical edition of Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 14.

- ***Στοιχεῖα.*** The Greek term means **"elements"** or "constituent principles". Vitruvius uses it in an ancient explanation of bodily composition through heat, moisture, earth and air. The passage belongs to Greek natural philosophy without requiring attribution to a single doctrinal lineage.
- ***moenibus conlocandis:*** In accordance with the previous paragraphs, "placing the walls" is ruled out in favor of a formal urban planning expression: **"establishing the walled enclosure"** or "founding the plan of the walled city", since climatic precaution affects the entire urban layout.
- ***Heat and humor, terrain and air:*** Vitruvius empirically associates perceptible qualities with physical substances: heat (fire), moisture (water), terrain (earth), and air. A literal translation would "of heat and humidity, earth and air"; the precision of the classical cosmological nomenclature is raised to **"heat, humidity, earth and air"**.
- ***animalium: It*** is technically translated as **"living beings"** or "animated creatures" (from the Latin *anima*, beings that possess vital breath). Limiting it to "animals" in contemporary Spanish erroneously reduces a concept that in the treatise primarily includes human beings and their physiological responses.

1.4.5 When planning the perimeter of walls, exposure to warm winds that affect human health should be avoided. The reason is that all organisms are composed of the principles that the Greeks call elements (*στοιχεῖα*) — heat, moisture, earth, and air — and it is the natural balance of these mixtures that determines the biological qualities of living beings in the world (Vitruvius, *De architectura* 1.4.5).

6. ergo in quibus ⟨vis⟩ corporibus cum exsuperat e principiis calor, tunc interficit dissolvitque cetera fervore. haec autem vitia efficit fervidum ab certis partibus caelum, cum insidit in apertas venas plus quam patitur e mixtionibus naturali temperatura corpus. item si umor occupavit corporum venas inparesque eas fecit, cetera principia liquido corrupta diluuntur et dissolvuntur compositionibus virtutes. item haec e refrigerationibus umoris ventorum et aurarum infunduntur vitia corporibus. non minus aeris etiamque terreni in corpore naturalis compositio

augendo aut minuendo infirmat cetera principia, terrena cibi plenitate, aer gravitate caeli.

6. In any body where heat predominates over the other principles, its excessive warmth destroys and dissolves them. An overheated climate produces these defects when it enters the open veins beyond what the body's natural balance can bear. If moisture fills the veins in excess, the other principles are weakened as though diluted, and the strength of their composition is dissolved. Cold moisture in winds and breezes likewise introduces these disorders. An increase or decrease in the natural proportions of air and earth also weakens the other principles: the earthy element through excessive food, and the airy element through the oppressive condition of the atmosphere.

Vitruvius uses zoology and elementary physics to illustrate how the proportion of the four elements determines the habitat of each species.

Critical Interlineation

Explanatory note: the στοιχεῖα and salubrity. In grounding the choice of site upon the balance of the elements, Vitruvius adopts the Greek doctrine of the στοιχεῖα —the "elements" or constituent principles of bodies—, which he enumerates in Latin as *calor, umor, terra*, and *aer* (heat, moisture, earth, and air). This conception derives from Greek natural philosophy (the four "roots" of Empedocles, later systematized by Aristotle) and is interwoven with Hippocratic medicine, particularly the treatise *Airs, Waters, Places*, which links climate and place to the health of the body. Vitruvius's originality lies in making this physiology the foundation of urban site selection (*salubritas*): the architect must choose elevated, temperate sites far from marshes so that the elemental mixture (*temperatura*) of the inhabitants' bodies remains in balance. Architecture is thereby bound to medicine—a connection Vitruvius himself claims when he requires the architect to know medicine *propter inclinationes caeli* (1.1.10).

Textual note — I.4.5. The adopted text transmits στοιχεῖα, "elements" or "principles". This edition retains the reading and confines its commentary to its role in Vitruvius's argument, without reconstructing a history of manuscript corruption that has not been checked directly against the witnesses.

1.4.7 *Sed si qui voluerit diligentius haec sensu percipere, animadvertat attendatque naturas avium et piscium et terrestrium animalium, et ita*

considerabit discrimina temperaturae. Aliam enim mixtionem habet genus avium, aliam piscium, longe aliter terrestrium natura. Volucres minus habent terreni, minus umoris, caloris temperate, aeris multum. Igitur levioribus principiis compositae facilius in aeris impetum nituntur. Aquatiles autem piscium naturae quod temperatae sunt a calido plurimumque ex aeris et terreni ⟨principiis⟩ sunt compositae sed umoris habent oppido quam paulum, quo minus habent e principiis umoris in corpore, facilius in umore perdurant, itaque cum ad terram perducuntur, animam cum aqua relinquunt. Item terrestria quod e principiis ab aere caloreque sunt temperata minusque habent terreni plurimumque umoris, quod abundant umidae partes, non diu possunt in aqua vitam tueri.

1.4.7 But if anyone wishes to perceive these things more carefully with his senses, let him observe and pay attention to the natures of birds and fish and terrestrial animals, and thus he will consider the differences in elemental composition. For the genus of birds has one mixture, that of fish another, and the nature of terrestrial animals is very different. Birds have less of the earth, less of the moisture, and temperate heat, and much of the air. Therefore, being composed of lighter principles, they more easily rely on the force of the air. But the aquatic natures of fish, because they are temperate from the heat and are composed of both air and earth, but have little moisture, because they have less of the moisture principles in their bodies, they more easily persist in moisture, and therefore when they are brought to land, they yield up their vital breath with the water. Likewise, terrestrial animals, because they are temperate from the principles of air and heat, have less of the earth and much of the moisture, because their moist parts abound, cannot long maintain life in water.

Academic translation

1.4.7 If anyone wished to understand these realities more rigorously through empirical observation, they should examine and pay attention to the nature of birds, fish, and land animals; in this way, they will be able to discern the differences in their elemental equilibrium (*temperatura*). For the genus of birds possesses one mixture, that of fish another, and the nature of land animals a very different one. Birds have less terrestrial matter and less moisture, moderate heat, and a large proportion of air; consequently, being composed of lighter elements, they rise more easily by propelling themselves on the air current. For their part,

the nature of aquatic fish, being tempered by heat and composed mostly of air and earth, possesses an extremely small amount of moisture; And the less liquid they contain in their bodies, the better they survive in the water, so that when they are extracted and brought to land, they exhale their vital breath upon losing contact with the water. Similarly, terrestrial animals, being tempered mainly by air and heat, possess a smaller proportion of land and a great abundance of moisture; and since liquid parts predominate in them, they cannot sustain life underwater for long.

Philological and Exegetical Apparatus

1. Marcus Vitruvius Pollio, De *architectura* 1.4.7. For the fixation and variants of the Latin text, see the critical edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 15; and Fritz Krohn's edition, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 15.

- ***sensu percipere:*** A literal translation would "to perceive with one's senses." Philologically, it implies the method of empirical observation or direct sensory verification, a pillar of Vitruvian technical thought as opposed to purely theoretical speculations.
- ***in aeris impetum nituntur:*** *The phrase should not be construed as "sustained by the attack of the air".* The noun *impetus refers to the driving force, current*, or thrust, while the verb *nitor* denotes the physical effort of leaning, propelling oneself, or breaking through. The correct translation is "propelling oneself in the air current. "
- ***oppido quam paulum:*** The archaic adverb oppido (reinforced by quam) emphasizes extreme scarcity. It should be translated as **"extremely scarce"** or "excessively little."
- *facilius in umore perdurant:* The truncated phrase "can survive longer in moisture" is corrected. The verb perdurare means "to subsist", "to remain" or "to last", indicating that the elemental affinity allows them to inhabit the aquatic environment continuously.
- ***animam... relinquunt:*** A literal translation "leave their souls with the water." In classical physiology, anima *is* the **vital breath or** respiration. Fish die when removed from their environment because they exhale their last breath along with the water that leaves their gills.

1.4.7 Empirical observation of fauna demonstrates the influence of elemental equilibrium (*temperature*). Birds, possessing more air and less earth, are easily propelled into the sky. Fish, composed mainly of air and earth but with little internal moisture, subsist optimally in water and die upon losing contact with it. Conversely, terrestrial animals are abundant in liquid elements, which prevents them from preserving life underwater (Vitruvius, *De architectura* 1.4.7).

Critical Interlineation

1.4.8 *Ergo si haec ita videntur quemadmodum proposuimus, et e principiis animalium corpora composita sensu percipimus et e superationibus aut defectionibus ea laborare dissolvique iudicamus, non dubitamus quin diligentius quaeri oporteat uti temperatissimas caeli regiones eligamus, cum quaerenda fuerit in moenium conlocationibus salubritas.*

1.4.8 Therefore, if these things appear as we have proposed, and we judge that they suffer and are dissolved from excesses or defects, we do not doubt that it is necessary to seek more carefully how to choose the most temperate regions of the sky, since healthiness must be sought in the placement of walls.

Academic translation

1.4.8 Consequently, if these realities manifest themselves as we have set them out, and if we judge that organisms sicken and become unstable on account of excesses or deficiencies in their elemental components, there can be no doubt that one must proceed with the greatest care in selecting the most temperate climatic regions, whenever salubrity is to be sought in the layout and siting of city walls.

Philological and Exegetical Apparatus)

1. Marcus Vitruvius Pollio, De *architectura* 1.4.8. For the definitive fixation of the Latin text, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 15; and Fritz Krohn's philological review, Vitruvii De *architectura libri decem* (Leipzig: Teubner, 1912), 15.

- ***e superationibus aut defectibus: In*** ancient medicine and hygiene, *superatio* is the **excess** (or plethora) of a humour or element, while *defectio* represents its **lack or insufficiency. Vitruvius argues that disrupting** thermal or hydric balance disrupts health.

- ***laborare dissolvique:*** The literal translation "worked and dissolved" is corrected. As established in passage 1.4.4, *laborare* means **"to become ill"** or "to suffer from a disorder," and *dissolvi* refers to the **destabilization** or collapse of the body's homeostatic balance.
- ***diligentius quaeri oporteat:*** The literal sense “it is necessary to investigate more carefully” requires contextual interpretation. The expression denotes methodological rigor and implies that the architect must carry out a **thorough preliminary investigation** of the territory (analyzing winds, water and sun exposure) before drawing a single line.
- ***in moenium conlocationibus:*** The vulgarism "placement of the walls" is once again eradicated. Technically and urbanistically, it refers to the **"layout and placement of the urban walls"** or the delimitation of the city's perimeter.

1.4.8 In conclusion, given that living beings become ill and collapse due to excesses or deficiencies of their elemental components, it is imperative that the architect investigate the territory with the utmost thoroughness to choose the most temperate climatic regions, thus guaranteeing health when determining the site of the walled city (Vitruvius, *De architectura* 1.4.8).

Critical Interlineation

9. Itaque etiam atque etiam veterem revocandam censeo rationem. Maiores enim pecoribus immolatis, quae pascebantur in îs locis, quibus aut oppida aut castra stativa constituebantur, inspiciebant iocinera, et si erant livida et vitiosa primo, alia immolabant dubitantes, utrum morbo an pabuli vitio laesa essent. Cum pluribus experti erant et probaverant integram et solidam naturam iocinerum ex aqua et pabulo, ibi constituebant munitiones; si autem vitiosa inveniebant, iudicio transferebant item humanis corporibus pestilentem futuram nascentem in his locis aquae cibique copiam, et ita transmigrabant et mutabant regiones quaerentes omnibus rebus salubritatem.

1.4.9 Again and again I think the old reason should be recalled. For the ancients examined the livers of the sacrificed cattle which were grazing in those places where towns or permanent camps were established, and if they were livid and defective at first, they sacrificed others, doubting whether they were damaged by disease or by the defect of the fodder. When they had tried many and had proved

the intact and solid nature of the livers from water and fodder, they established fortifications there; but if they found them defective, they transferred the judgment to human bodies, and the future abundance of water and food growing in these places would be pestilent, and so they migrated and changed regions, seeking health in all things.

Academic translation

1.4.9 I believe that the methodology of our ancestors should be recovered, time and again. Indeed, after sacrificing some of the cattle grazing on the lands where they planned to establish cities or permanent camps, they examined their livers. If at first these appeared bruised and diseased, they sacrificed other animals to determine whether the damage was due to an internal pathology or the poor quality of the pasture. Only when, after multiple experiments, they verified that the livers were healthy and robust thanks to the purity of the water and fodder, did they proceed to build fortifications there. Conversely, if they found them damaged, they deduced that the water and food supply produced in that place would be equally pestilent to the human body, so they migrated and changed regions, seeking health in all aspects.

Philological and Exegetical Apparatus

1. Marcus Vitruvius Pollio, De *architectura* 1.4.9. The examination of the livers of local livestock is section 9 in both Krohn and Rose; *sectio*ns 11 and 12 concern coastal marshes and *the relocation of Salpia*.

- **to recall the old... reason:** A mechanical repetition of “reason” obscures the technical force of the expression. Philologically it means "method", "procedure", or "practical criterion". Vitruvius defends the pragmatism of the ancient Roman traditiones against merely speculative theory.
- ***maiores enim pecoribus:*** The phrase should not be construed as “the elders of the sacrificed cattle”. Maiores *means* " **the ancestors"** or "our elders," and *pecoribus immolatis* is an ablative absolute referring to the heads of cattle offered in ritual sacrifice.
- ***iocinera / iocinerum:*** He translated *iocinera* first as "wild animals" and then *iocinerum* as "the water play." *Iocur* (plural *iocinera*) is the Latin anatomical term for the **livers.** The livers of local cattle acted as a biological laboratory, assimilating toxins from the soil and water before the city was built.

- ***livida et vitiosa:*** It is translated with classical medical precision as " bruised and **sick"** (or damaged), surpassing the colloquial term "bruised".
- ***castra stativa:*** The adjective stativa is indispensable to the technical sense.In Roman military engineering, this refers not to just any camp, but to **"permanent camps"** or stable barracks, whose long-term health was as critical as that of a civilian city.
- *nascentem*... a supply of water and food, alluding to the "natural yield" — the resources that spring from the very soil of the place.

1.4.9 It is imperative to recover the method of our ancestors, who, before founding cities or permanent camps (*castra stativa*), sacrificed local livestock to examine their livers (*iocinera*). If the organs were diseased, they determined that the water and fodder of the place would also poison human bodies; therefore, they only built where the livers appeared healthy and robust, guaranteeing the healthfulness of the settlement (Vitruvius, *De architectura* 1.4.9).

Philological, historical and scientific analysis of passage **1.4.9**, formally structured for its insertion as an exegetical apparatus in a critical edition or academic article.

Exegetical Analysis of De *architectura* 1.4.9

1. The Legacy of Tradition: *Mos Maiorum* and Roman Pragmatism

Vitruvius opens the passage with a forceful methodological statement: *"Etiam atque etiam veterem revocandam censeo rationem "* ("I believe that the methodology of our ancestors must be recovered, again and again "). This recourse is not merely nostalgic; it corresponds to the Roman concept of ***mos maiorum*** (the custom of the ancestors) as a legitimate source of technical and moral knowledge.

In contrast to the abstract speculation of the Hellenistic philosophical schools, the author champions ancient *ratio*: a profoundly empirical criterion, based on continuous observation and accumulated success. For Vitruvius, the architect is a steward of public space and, as such, inherited tradition is a safety protocol tested by generations.

Ritual Aruspicin to Empirical Health Control

The core of the passage describes the examination of cattle entrails (inspicere *iocinera*), a practice formally identical to haruspicy**,** the ancient divinatory

discipline of Etruscan origin regulated by *haruspices*. However, Vitruvius performs a **radical demythologization** of the ritual:

- **Absence of the sacred:** Livers are not examined to look for signs of the gods (such as *caputiocineris* or prophetic lines), but to check their objective physiological state (*integram et solidam naturam*).
- **Livestock as a bioindicator:** Vitruvius understood that animals grazing in a fixed location act as a biological laboratory that metabolizes and concentrates the properties of the soil, the pastures (*pabulum*), and the water (*aqua*). If the liver shows necrosis or discoloration (livida *et vitiosa*), the ecosystem is corrupted.
- **The preliminary scientific method: The author** describes a two-step verification protocol. If the first liver is damaged, more cattle are sacrificed (*alia immolabant*) to rule out an isolated pathology of the specimen (morbo*)* versus an endemic environmental poisoning (pabuli *vitio*).

3. The Theory of Miasma Contamination and Human Ecology

The passage demonstrates the connection between Roman architecture and the medical theories of the Hippocratic school, specifically the treatise *On Airs, Waters, and Places*. Vitruvius establishes a **direct correlation** between animal and human health: the territory that destroys the organs of livestock will, sooner or later, destroy the constitution of the urban inhabitant (*item humanis corporibus pestilentem futuram*).

The conclusion of the passage introduces a criterion for urban planning subordinated to ecology: if the environment is unhealthy, the solution is not constructive, but migratory (*transmigrabant et mutabant regiones*). Architecture cannot defeat nature; it must ally itself with its thermal and hydrological cycles.

4. Military Application: *Castra Stativa*

The explicit mention of ***castra stativa (***permanent camps or winter quarters) underscores the strategic importance of hygiene in Roman engineering. The Roman army could not afford epidemiological outbreaks in the legions stationed on the frontiers (*limes*). Analysis of the terrain using haruspicy (wisdom for livestock) was a mandatory step before the deployment of fixed defenses (*munitiones*), thus equating the rigor of military architecture with that of the founding of large civilian cities (*oppida*).

Vitruvius Passage 1.4.10 (recorded as 10).

Vitruvius presents the Cretan example to connect the properties of pasture and food with the bodily condition of cattle. The plant name is ἄσπληνον. The lacuna in the adopted Latin and the uncertainty of modern botanical identification must remain visible.

Latin text

*10. Hoc autem fieri, uti pabulo ciboque salubres proprietates terrae videantur, licet animadvertere et cognoscere ex agris Cretensium, qui sunt circa Pothereum flumen, quod est Cretae inter duas civitates Gnoson et Gortynam. Dextra enim et sinistra eius fluminis pascuntur pecora; sed ex his quae pascuntur proxime Gnoson si * * * quae autem ex altera parte proxime Gortynam, non habent apparentem splenem. Unde etiam medici quaerentes de ea re invenerunt in his locis herbam, quam pecora rodendo inminuerunt lienes. Ita eam herbam colligendo curant lienosos hoc medicamento, quod etiam Cretenses ἄσπληνον vocitant. Ex eo licet scire cibo atque aqua proprietates locorum naturaliter pestilentes aut salubres esse.*

1.4.10 The properties of the land as revealed through fodder and food may be observed in the Cretan fields around the river Pothereus, between Knossos and Gortyna. Cattle graze on both banks. Those near Knossos [...] whereas those on the other side near Gortyna have no visible spleen. Investigating this, physicians found a local plant whose consumption by the cattle reduced their spleens. They therefore collected it to treat patients with diseases of the spleen; the Cretans call the remedy asplenon (ἄσπληνον). Food and water thus reveal whether a place's natural properties are healthy or unhealthy.

Textual note — I.4.10. The authorial Spanish base marks a lacuna after the cattle near Knossos, as does the adopted Krohn text. The electronic transcription of Rose supplies <lienosa> sunt, "have diseased spleens", to complete the contrast with Gortyna. This is an editorial supplement, not a directly verified reading of Harley or Cotton. Asplenon (ἄσπληνον) is the plant name in the adopted text; its usual comparison with spleenwort belongs to botanical interpretation, not to the constitution of the damaged clause.

Textual note — I.4.10. Krohn's critical text retains a lacuna after proxime Gnoson; an unverified conjecture is therefore not introduced into the Latin as though it were transmitted text. Ἄσπληνον is the plant's Greek name in the passage; this edition does not impose a single modern botanical identification.

Academic translation

1.4.10 That this occurs — that is, that the salutary or harmful properties of the soil are manifested through fodder and food — can be observed and verified in the fields of Crete situated around the Potereus River, which flows between the cities of Knossos and Gortyna. Indeed, herds of cattle graze on both the right and left banks of this river; however, the cattle grazing on the bank closest to Knossos [in the supplemented interpretation] suffer from disorders of the spleen, while those feeding on the other bank, near Gortyna, do not have a noticeably enlarged spleen. For this reason, physicians, investigating the phenomenon, discovered in those areas a type of grass on which the cattle fed and which, when gnawed, reduced the size of their spleens. Thus, by harvesting this plant, they cure spleen ailments today with this medicine, which the Cretans call ásplenon (ἄσπληνον). From this fact, it can be inferred with certainty that, through food and water, the latent properties of the land naturally result in pestilent or healthy conditions.

Philological and Exegetical Apparatus

3. Marcus Vitruvius Pollio, De architectura 1.4.10. For discussion of the emendations and gaps in the Cretan text, see Valentin Rose, Vitruvii De architectura libri decem (Leipzig: Teubner, 1899), 16-17; and Fritz Krohn, Vitruvii De architectura libri decem (Leipzig: Teubner, 1912), 16-17.

- Potherium flumen / Gnoson et Gortynam: Mythical and real geography combined. Vitruvius uses the topography of Crete (the rivals Knossos and Gortyna) to offer a natural experiment with a control group (the river acts as a strict ecological boundary).
- σπλήν) and the purely Latin term lien interchangeably to refer to the spleen. In ancient medicine (following the theory of the four humours), the spleen was the organ responsible for processing black bile; its inflammation or atrophy drastically altered the temperament and health of the individual.
- Lienous curants: Scrofula is an infection of the lymph nodes (cervical tuberculosis), while lienous strictly refers to "spleen sick" or splenomegalic patients.
- ἄσπληνον (Asplenon): Botanically identified with Asplenium ceterach (golden fern), a medicinal fern still used in traditional pharmacopoeia for its

diuretic properties and against kidney and spleen ailments. Vitruvius connects botanical pharmacology with hygienic urbanism.

1.4.10 The influence of the soil on health is evident in the fields of Crete, along the Potereus River. Cattle grazing on the banks of Knossos are interpreted, on the supplemented reading, as suffering from spleen disorders, while those on the banks of Gortyna lack a visible spleen due to the consumption of a local plant. After identifying this herb, physicians began using it as a medicine to treat spleen ailments, calling it asplenon (ἄσπληνον). This case demonstrates that the properties of water and food scientifically determine the healthfulness of a settlement (Vitruvius, De architectura 1.4.10).

4. Ingrid D. Rowland and Thomas Noble Howe, eds., Vitruvius: 'Ten Books on Architecture' (New York: Cambridge University Press, 1999), 28.

This fragment is of paramount historical importance because it describes the hydraulic engineering and environmental sanitation works of the Po Valley.

Critical Interlineation

1.4.11 *Item si in paludibus moenia constituta erunt, quae paludes secundum mare fuerint, spectabuntque ad septentrionem aut inter septentrionem et orientem, eaeque paludes excelsiores fuerint quam litus marinum, ratione videbuntur esse constituta. Fossis enim ductis fit aquae exitus ad litus, et mare tempestatibus actum in paludes redundantia motionibus concitata marisque mixtionibus non patitur bestiarum palustrium genera ibi nasci, quaeque de superioribus locis natando proxime litus perveniunt, inconsueta salsitudine necantur. Exemplar autem huius rei Gallicae paludes possunt esse quae circum ⟨cingunt⟩ Altinum, Ravennam, Aquileiam aliaque quae in eiusmodi locis municipia sunt proxima paludibus, quod his rationibus habent incredibilem salubritatem.*

1.4.11 Likewise, if walls are built in marshes, which marshes are next to the sea, and face north or between north and east, and those marshes are higher than the seashore, they will seem to have been built for a reason. For by digging ditches, the water is brought to the shore, and the sea, increased by storms, overflowing into the marshes, agitated by the movements and mixtures of the sea, does not allow the kinds of marsh animals to be born there, and those that swim from higher places to reach the shore are killed by the unusual salinity. An example of this can be the marshes of Gaul which are around Altinus, Ravenna, Aquileia

and others which are in such places towns close to the marshes, because for these reasons they have an incredible salubrious effect.

1. ***Gallicae paludes: A recurring*** historical error in literal translations that render it as "the marshes of France." In the geography of the 1st century BC, it strictly refers to the marshes of **Cisalpine Gaul** (the region of northern Italy, around the Po River delta and the Venetian Lagoon). — 2. ***Altinum, Ravenna, Aquileia:*** Strategic Roman cities on the northern Adriatic coast, famous for their complex system of canals and lagoons that combined commercial navigation with environmental health.

Academic translation

1.4.11 Likewise, if a walled city is established on marshy land, provided that these marshes are located by the sea, facing north or between north and east, and are at a higher altitude than the seashore, its foundation will be considered to have been carried out according to sound architectural principles (*ratione*). Indeed, by opening ditches and canals, the drainage of stagnant water towards the coast is facilitated; moreover, when the sea rises due to storms, its overflows flow back into the marshes, whose waters, agitated by the waves and mixed with the sea flow, prevent the proliferation of the various species of marsh vermin; as for the microorganisms that swim down from the highlands towards the coast, they perish immediately upon being exposed to a salinity to which they are not accustomed. As an example of this phenomenon, one can cite the marshes of Cisalpine Gaul that surround Altino, Ravenna and Aquileia, as well as other municipalities that, being in similar places and adjacent to the marshes, enjoy extraordinary health thanks to these engineering principles.

Philological and Exegetical Apparatus)

3. Marcus Vitruvius Pollio, *De architectura* 1.4.11. For the geographical and textual fixation of the Cisalpine, see Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 15-16; and Fritz Krohn, Vitruvii *De architectura libri decem* (Leipzig: Teubner, 1912), 15-16.

- ***ratione videbuntur esse constituta:*** A literal translation would render in a disjointed way "it will be seen that they have been established by reason." The technical expression ratione implies that *the* architectural project complies with the **principles of constructive logic and physical science,** being fully justified.

- ***marique mixtionibus:*** A literal version misinterpreted the text, translating it as "bitter mixtures" (probably confusing mare *with* the adjective *amarus*). Vitruvius is strictly referring to the **mixture or combination of stagnant fresh water with salt water from the sea**, a physical phenomenon that alters the ecosystem and prevents the water from rotting (*putrefactio*).
- ***inconsueta salsitudine necantur:*** Vitruvius describes a biological principle of osmotic shock: freshwater organisms descending from the rivers of the highlands (*de superioribus locis*) die upon contact with the **"unusual salinity"** of the marine lagoon.
- ***Incredible health:*** The paradox that marshy areas like Ravenna or Aquileia were " incredibly healthy" fascinated ancient authors. Vitruvius demonstrates that the constant movement of water (tidal dynamics and artificial canals) counteracts the miasma of stagnant water that was analyzed in the previous paragraphs.

Translation and Commentary

1.4.11 Cities founded in marshy areas adjacent to the sea are viable if the marshes are located at a higher altitude than the coastline. The opening of channels (*fossis*) allows the waters to drain into the sea, while the tidal flow mixes the salt water with the fresh water, eradicating marsh vermin through osmotic shock. This principle of hydraulic engineering explains the extraordinary healthfulness of the municipalities of Cisalpine Gaul, such as Altino, Ravenna, and Aquileia (Vitruvius, *De architectura* 1.4.11).

4. Rowland and Howe, *Vitruvius*, 28.

This fragment contains one of the most valuable historical and urban-planning accounts in the treatise: the relocation of the city of Salpia for reasons of public health.

Critical Interlineation

1.4.12 *Quibus autem insidentes sunt paludes et non habent exitus profluentes neque per flumina neque per fossas, uti Pomptinae, stando putescunt et umores graves et pestilentes in îs locis emittunt. Item in Apulia oppidum Salpia vetus, quod Diomedes ab Troia rediens constituit sive quemadmodum nonnulli scripserunt Elpias Rhodius, in eiusmodi locis fuerat conlocatum, ex quo incolae quotannis aegrotando laborantes aliquando pervenerunt ad M. Hostilium ab eoque publice petentes impetraverunt ut is idoneum locum ad moenia*

transferenda conquireret eligeretque. Tunc is moratus non est, sed statim rationibus doctissime quaesitis secundum mare mercatus est possessionem loco salubri ab senatuque populoque Romano petît ut liceret transferre oppidum, constituitque moenia et areas divisit nummoque sestertio singulis municipibus mancipio dedit. His confectis lacum aperuit in mare et portum e lacu municipio perfecit. Itaque nunc Salpini quattuor milia passus progressi ab oppido veteri habitant in salubri loco.

1.4.12 Marshes that remain stagnant and have no outlet through rivers or ditches, such as the Pontine Marshes, become putrid and emit heavy, unhealthy vapors. Old Salpia in Apulia, founded by Diomedes on his return from Troy or, according to other writers, by Elpias of Rhodes, stood in such a place. Its inhabitants, afflicted by illness every year, eventually appealed to Marcus Hostilius and obtained his agreement to seek a suitable site for moving the town. He acted without delay: after careful investigation he purchased land in a healthy place by the sea, obtained permission from the Roman Senate and people, built the walls, divided the building plots and conveyed each plot to a citizen for one sestertius. He then opened the lake to the sea and made it a harbour for the town. The people of Salpia now live in a healthy place, four Roman miles from the old town.

Academic translation

1.4.12 On the contrary, cities surrounded by marshes lacking drainage outlets — either rivers or canals, as with the Pontine Marshes — become unhealthy, as their stagnant waters become polluted and emit dense, pestilent fumes. A similar case occurred in Apulia with the ancient city of Salpia, founded by Diomedes upon his return from Troy or, according to some authors, by the Rhodian Elpias. Located on such terrain, its inhabitants suffered from serious illnesses annually, so they formally petitioned Marcus Hostilius and publicly begged him to find and select a suitable site to relocate the city. Hostilius did not delay; After conducting a highly scientific investigation based on physical principles, he acquired a healthy plot of land by the sea and requested permission from the Roman Senate and people to relocate the city. Once granted, he erected new walls, divided the urban land into parcels, and granted legal ownership to each citizen for the symbolic price of one sestertius. Upon completion of these works, he opened a channel from the lagoon to the sea, providing the municipality with

a safe harbour on the lake. For this reason, the inhabitants of Salpia live today in a healthy location, four miles from their former city.

Philological and Exegetical Apparatus)

1. Marcus Vitruvius Pollio, De *architectura* 1.4.12. For the fixation and variants of the Latin text of Salpia's move, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 16; and Fritz Krohn's review, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 16.

- ***Pontine Marshes:*** The **Pontine Marshes** (*Paludes Pomptinae*), located south of Latium, represented the greatest challenge of unsanitary conditions and drainage in central Italy. Vitruvius cites them as the paradigmatic example of stagnant and incurable waters of his time.
- ***stando putescunt:*** "standing up they rot." The verb stare *here* has the technical value of " **to stagnate"** (water that does not flow). Correctly translated it is: **"when they stagnate, they spoil**. "
- ***serious humors:*** It does not refer to "heavy waters" in the liquid sense, but to **"dense exhalations"**, miasmas or vapors laden with corrupted particles that floated on the air of the swamp affecting respiration.
- M. Hostilium: the Marcus Hostilius named in Vitruvius's account of the relocation of Salpia. The passage gives no office, cognomen, or precise date for his intervention.
- ***areas divisit:*** "divided the territories". In Roman urban planning, *areas* are the **"plots"** or parcels of land designated for the construction of houses within the new orthogonal layout of the city.
- nummo sestertio ... mancipio dedit: Hostilius conveyed each building plot by mancipatio for a nominal sestertius. The legal formula denotes a formal transfer of ownership. The passage does not specify a beneficiary class or supply the full legal circumstances of the transaction.

1.4.12 Lands with stagnant, undrained water, such as the Pontine Marshes, become corrupted, emitting pestilent miasmas. This affected ancient Salpia in Apulia, where its citizens fell ill annually until Marcus Hostilius, through a rigorous technical study, moved the city to a healthy location by the sea. Hostilius walled the perimeter, subdivided the building plots (*areas*), legally assigning them for a symbolic sestertius, and connected the lagoon to the sea to

provide the municipality with a functional port (Vitruvius, *De architectura* 1.4.12).

Comparative critical apparatus — I.4.1–12. The chapter has been compared with Krohn (1912) and Philippe Fleury's Budé edition. The general structure is stable, but several points require caution: in I.4.1 moenia must be understood in relation to the urban enclosure, not merely the physical wall; spiritus bestiarum palustrium belongs to an ancient environmental explanation of disease and does not justify a microbiological reading; in I.4.2 lumina capere is architectural language for opening or arranging apertures for light; in I.4.5 στοιχεῖα denotes constituent principles or elements; and in I.4.10 the Cretan example contains a lacuna that should not be completed without editorial support. The notes consistently distinguish Latin reading, historical interpretation and modern reception.

Historical and medical note — I.4. The chapter combines environmental observation, the theory of four principles, material analogies, animal feeding and sacrificial practices as criteria for a healthy site. Its historical value lies in showing how Vitruvius integrates the medicine, climatology and urban planning of his time; it should not be presented as anticipating contemporary epidemiology or environmental hygiene.

Comparative apparatus — I.4. The siting of a city is organized around salubritas, exposure, moisture, marshes and climatic conditions. The critical text confirms "electio loci saluberrimi… excelsus et non nebulosus, non pruinosus… temperatas… palustris vicinitas". The translation preserves this ancient environmental medicine without presenting it as contemporary epidemiology.

Medical and historical note — Salubritas. Explanations of airs, bodies, humours and diseases belong to an ancient physiological framework. Where a topographical observation—drainage, moisture or insolation—can be compared with modern environmental criteria, that comparison is offered as technical reception, not as literal validation of Vitruvius's aetiology.

Textual note — Inspection of viscera. The use of sacrificed animals to assess the healthiness of pastures and waters is retained as an ancient practice described by Vitruvius. It is neither recast as a modern diagnostic method nor omitted because it lies outside present architectural practice.

Chapter 5

Latin text

1.5.1 *Cum ergo his rationibus erit salubritatis moenium conlocandorum explicatio regiones[que] electae fuerint fructibus ad alendam civitatem copiosae et viarum munitiones aut opportunitates fluminum seu per portus marinae subvectionis habuerit ad moenia comportationes expeditas, tunc turrium murorumque fundamenta sic sunt facienda uti fodiantur, si queat inveniri, ad solidum et in solido, quantum ex amplitudine operis pro ratione videatur, crassitudine ampliore quam parietum qui supra terram sunt futuri, et ea impleantur quam solidissima structura.*

1.5.1 When, therefore, the healthiness of the site for the walls has been secured on these principles, and a region has been chosen abounding in produce to feed the city, and the road network—or the advantage of a river, or the access of a sea-port—has provided ready means of transport to the walls, then the foundations of the towers and walls are to be laid in the following manner. Let them be dug down, if firm ground can be reached, to solid bottom and set within the solid, to a depth proportionate to the scale of the work, and made of a greater thickness than the walls that are to rise above the ground; and let the trenches be filled with the most solid masonry that can be laid.

Academic translation

1.5.1 Once the sanitary viability of the site for the walls has been determined in accordance with these principles, and after choosing a territory abundant in crops to sustain the city; and provided that the road network, the advantages of the waterways, or maritime transport via ports offer expeditious routes for supplying the urban area, the construction of the foundations of the towers and walls will then proceed. These must be excavated — whenever possible — down to firm ground and embedded within it, penetrating to a depth that seems proportionate to the scale of the work; their thickness must be greater than that of the walls that will rise above ground level, and the trenches must be filled with a structure that is as solid and compact as possible.

Philological and Exegetical Apparatus)

1. Marcus Vitruvius Pollio, De *architectura* 1.5.1. For the definitive fixation of the construction syntax, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 17-18; and the philological

review of Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 17-18.

- ***Chapter 5:*** The old title is normalized to the contemporary scientific nomenclature **1.5.1** (Book I, Chapter 5, Paragraph 1) to give continuity to the critical apparatus of the manuscript.
- fructibus ad alendam civitatem copiosae: The clause can be overlooked during transcription because of similar neighboring endings; any claim of a scribal omission must be established by collation. Vitruvius relates the healthfulness of the city's location to the availability of fertile land and sufficient provisions for its inhabitants.
- ***viarum munitiones / subvectiones expeditas:*** Second major omission from a literal version. It refers to transport infrastructure. *Viarum munitiones* does not mean defenses, but the **"construction and paving of roads"**, while *subvectiones* refers to the logistical supply and import of goods via waterways or ports.
- ***ad solidum et in solido:*** A fundamental technical term in Roman foundation engineering. *Solidum* designates the **bedrock**, the firm geological stratum, or the compact, non-clayey ground. Vitruvius requires two conditions: excavating *until* the firm stratum is reached (*ad solidum*) and laying the foundations *within* that stratum (*in solido*). A literal version incorrectly summarized this as "in the solid mass."
- ***crassituine ampliare quam parietum:*** Classic structural principle. Underground foundations must have a **greater thickness** than the exterior walls (*parietes*) to correctly distribute axial loads and avoid collapses or differential settlements.

1.5.1 After ensuring the health of the site, agricultural supplies, and river, sea, or land communications, the foundations of towers and walls will be laid. Excavation must proceed down to solid rock (*ad solidum) and* deepen in proportion to the scale of the construction. The underground foundation will be thicker than the upper walls and will be filled with extremely compact masonry (Vitruvius, *De architectura* 1.5.1).

Latin text

1.5.2 *Item turres sunt proiciendae in exteriorem partem, uti cum ad murum hostis impetu velit adpropinquare, a turribus dextra ac sinistra lateribus apertis telis vulnerentur. Curandumque maxime videtur ut non facilis aditus sit ad oppugnandum murum, sed ita circumdandum ad loca praecipitia et excogitandum uti portarum itinera non sint directa sed scaeva. Namque cum ita factum fuerit, tum dextrum latus accedentibus quod scuto non erit tectum proximum erit muro. Conlocanda autem oppida sunt non quadrata nec procurrentibus angulis sed circinationibus, uti hostis ex pluribus locis conspiciatur. In quibus enim anguli procurrunt, difficiliter defenditur, quod angulus magis hostem tuetur quam civem.*

1.5.2 *Likewise, the towers must be projected beyond the outer face of the wall, so that when an enemy seeks to press an assault against it, he may be wounded by missiles from the towers on his right and left, his flanks lying exposed. Above all, care must be taken that there be no easy approach for storming the wall; rather, the ground about the towers should be so disposed that the way to the gates runs not straight but obliquely, bearing to the left. For when this is done, the right side of those advancing—the side not covered by the shield—will lie nearest the wall. Towns ought to be laid out not as a square, nor with projecting angles, but in a rounded circuit, so that the enemy may be observed from several points; for where angles project, defense is difficult, since the angle shields the enemy rather than the townsman.* [123]

Academic translation

1.5.2 Likewise, the towers should project outwards from the perimeter so that, when the enemy attempts to rush towards the wall, they are exposed on their left and right flanks and are wounded by projectiles launched from the towers. Similarly, every effort must be made to prevent easy access for assaulting the wall; on the contrary, the perimeter should be laid out taking advantage of steep terrain, and the access routes to the gates should be planned obliquely, not straight. When this is done, the right flank of the attackers — which is not

123 Scaeva describes an oblique or skewed approach. Vitruvius's explanation presupposes a shield carried on the left arm: the attacker's right side is more exposed as he approaches the wall.

covered by the shield — lies nearest the wall. Furthermore, the layout of cities should not be square or have sharp angles, but rather be arranged in continuous curved lines, so that the enemy can be spotted from multiple sides. In fact, where angles protrude, defense becomes extremely difficult, because the corner offers more protection to the attacker than to the citizen.

Philological and Exegetical Apparatus

1. Marcus Vitruvius Pollio, De *architectura* 1.5.2. For the fixation of the tactical terms of Roman poliorcetics, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 18; and the philological review of Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 18.

- ***Lateribus apertis:*** In Roman military terminology, *latera aperta* refers to the **"open" or unprotected flanks** of a battle formation. The projecting arrangement of the towers allowed for a deadly crossfire that battered the flanks of the attacking troops.
- ***itinera... non sint directa sed scaeva:*** A literal version erred in translating *scaeva* as "accident-ridden." *Scaevus* means **"oblique**," "deviated to the left," or "skewed." Vitruvius introduces here a classic rule of siege tactics: to force the enemy to approach by turning to the left.
- erit ***tectum:*** A literal version suffered a notable lexical confusion by translating *scuto* (shield) as "roof" (*tectum* is here the participle of the verb *tegere*, to protect). Since Roman and Hellenistic soldiers carried the shield (*scutum*) on their left arm, the **right flank was completely unprotected**. If the route forced them to march with their right side exposed towards the wall, the defenders could easily shoot them with arrows.
- ***circumitionibus:*** Not " Circles." Vitruvius does not demand perfectly circular cities, but rather layouts **"in continuous curved lines"** or organic shapes that follow the topography of the land, avoiding straight lines and corners that create blind spots.
- ***angulus magis hostem tuetur quam civem:*** Geometric explanation of blind spots in fortifications. A salient angle (*procurrentibus angulis*) provides a sheltered space or " blind spot " where the attacker can take cover from projectiles falling from the top of adjacent walls.

1.5.2 Defensive towers should project beyond the perimeter to engage the enemy's exposed flanks (*lateribus apertis*) with crossfire. Access routes to the gates should not be direct but oblique (scaeva*)*, forcing attackers to expose their right flank, unprotected by a shield (*scuto*). Likewise, the city's layout should avoid projecting angles and adopt a continuous curved design (*circumitionibus*), preventing the enemy from exploiting blind spots at the corners for cover from the defenders (Vitruvius, *De architectura* 1.5.2).

Latin text

1.5.3 *Crassitudinem autem muri ita faciendam censeo uti armati homines supra obviam venientes alius alium sine inpeditione praeterire possint. dum in crassitudine perpetuae taleae oleagineae ustilatae quam creberrime instruantur, uti utraeque muri frontes inter se, quemadmodum fibulis, his taleis conligatae aeternam habeant firmitatem. Namque ei materiae nec caries nec tempestates nec vetustas potest nocere, sed ea et in terra obruta et in aqua conlocata permanet sine vitiis utilis sempiterno. Itaque non solum in muro sed etiam in substructionibus quique parietes murali crassitudine erunt faciundi hac ratione religati non cito vitiabuntur.*

1.5.3 I hold that the thickness of the wall should be such that armed men meeting upon it can pass one another without hindrance; and within that thickness let continuous tie-beams of charred olive-wood be set as closely as possible, so that the two faces of the wall, bound together by these beams as if by clamps, may possess lasting strength. For no decay, no tempest, and no lapse of time can harm that material; rather, whether buried in the earth or set in water, it endures sound and serviceable for ever. And so, not only in the walls but also in the substructures, and in any partitions built to the thickness of a wall, whatever is bound together in this manner will not soon fall into decay.

Academic translation

1.5.3 I further consider that the thickness of the wall should be designed so that two armed men passing each other on it can do so without hindrance. Likewise, along the entire thickness of the wall, continuous, charred olive wood braces should be placed as frequently as possible, so that both sides of the wall are firmly fastened together by these timbers, like clamps (*fibulae*), thus achieving perpetual strength. Indeed, this is a material that neither rot, nor inclement weather, nor the passage of time can damage; on the contrary, even when buried

or submerged in water, it remains intact and usable indefinitely. Therefore, not only in the curtain walls, but also in the substructures and in those walls that must be built with the thickness of a fortification, if they are joined using this procedure, they will not suffer deterioration over time.

Notes (Explanation of Vitruvius's Text)

1. Marcus Vitruvius Pollio, De *architectura* 1.5.3. For the textual fixation and readings of the manuscript regarding the compound term utilis *sempiterno*, see the critical edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 18-19; and Fritz Krohn's edition, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 18-19.

- ***Armati homines... praeterire possint:*** Vitruvius defines the minimum thickness of the parapet or wall-walk not by means of abstract units of measurement (feet or cubits), but through a criterion of **military logistical functionality. The ideal width must guarantee the free bidirectional and** simultaneous flow of heavily armed sentries (*armati*) during a siege, avoiding tactical bottlenecks.
- *oleagineae* ***ustilatae):*** The use of olive wood *taleae* (braces, crossbeams, or stakes) applied an empirical principle of structural strength. Vitruvius prescribed that the wood be singed or charred superficially (*ustilatae*). This thermal process removes the internal moisture from the wood and alters the organic compounds that attract wood-boring insects, acting as an ancient and effective method of waterproofing **and biological preservation**.
- ***quemadmodum fibulis:*** In this context of construction engineering, the term fibula designates a clamp, connector, or **locking key**. Roman walls typically consisted of two outer faces of ashlar or masonry (*frontes*) filled internally with a core of loose stones and mortar (*caementicium*). Olive beams acted as transverse tensioners that tied both faces of the wall together, preventing the internal pressure of the fill from causing the structure to burst.
- ***In earthly and underwater environments:*** Vitruvius praises the rot-resistant properties of olive wood treated with fire. Its resistance in underground and underwater environments made it ideal for substructures (***retaining*** foundations or embankments), where constant humidity usually rotted other types of construction wood.

1.5.3 The thickness of the parapet wall must allow the smooth passage of two armed soldiers. To ensure the cohesion of the structure, charred olive beams (*taleae oleagineae ustilatae*) must be inserted transversely to act as fasteners (*fibulae*) joining the two faces of the wall. Because fire-treated wood is immune to rot and moisture from the ground or water, this method of fastening guarantees the durability of both the defensive walls and the substructures (Vitruvius, *De architectura* 1.5.3).

Critical Interlineation

1.5.4 Intervalla autem turrium ita sunt facienda ut ne longius sit alia ab alia sagittae missionis, uti si qua oppugnetur, tum a turribus quae erunt dextra sinistra scorpionibus reliquisque telorum missionibus hostes reiciantur. Etiamque contra interiores ⟨partes⟩ turrium dividendus est murus intervallis tam magnis quam erunt turres, ut itinera sint interioribus partibus turrium contignata, neque ea ferro fixa. Hostis enim si quam partem muri occupaverit, qui repugnabunt rescindent et si celeriter administraverint, non patientur reliquas partes turrium murique hostem penetrare, nisi se voluerit praecipitare.

1.5.4 The intervals between the towers should be so arranged that no one tower stands further from the next than a bowshot, so that if any point is besieged, the enemy may be driven off by scorpions and other missiles from the towers to right and left. Opposite the lower part of the towers the wall should likewise be interrupted by gaps as wide as the towers themselves, and the passages across these gaps, within the towers, should be floored with timber that is not fastened with iron. For should the enemy seize any part of the wall, the defenders will cut away these timbers; and if they act quickly, they will not suffer the enemy to penetrate the remaining towers and stretches of wall—unless he is willing to fling himself headlong.

Academic translation

1.5.4 The intervals between the towers should be arranged so that the distance from one to another does not exceed the range of an arrow's shot; thus, if a section of the curtain wall is attacked, the enemy can be repelled from the towers to its right and left by the fire of scorpions and other ranged weapons. Likewise, the parapet of the wall, upon reaching the interior of the towers, should be interrupted by openings of a width equivalent to that of the towers themselves;

the passageways through these interior openings should be made of wooden platforms (*contignata itinera*) which should not be fixed with iron fittings. In this way, if the enemy manages to seize any section of the wall, the defenders can cut off the passage by quickly destroying the walkways; If they act swiftly, they will prevent the attacker from penetrating the remaining sections of the towers or the wall, unless he decides to throw himself into the void.

Critical Notes

1. Marcus Vitruvius Pollio, De *architectura* 1.5.4. For the detailed study of the manuscript variants regarding ballistic machinery and Roman military carpentry (*contignata*), see Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 19; and Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 19.

- ***Sagittae missionis / scorpionibus:*** Vitruvius subordinated the geometry of the urban perimeter to the effective range of Hellenistic and Roman torsion artillery. The *scorpio* (scorpion) was a light, precision catapult that launched iron bolts with a flat trajectory and lethal penetrating power. By spacing the towers closer than the range of a common arrow, it was ensured that any intermediate point along the curtain wall (*curtina*) was perfectly covered by the artillery flanks of the adjacent towers.
- ***dividens est murus / intervallis tam magnis:*** The verb *dividere* here has the sense of "to interrupt" or "to fracture." Vitruvius prescribes a revolutionary structural solution for his time: the wall should not be a continuous passageway over which the enemy can run freely if they manage to scale a section. The wall walk should be physically interrupted at the internal access points that cross the towers.
- ***itinera... contignata, neque ea ferro fixa:*** Demountable wooden walkways. *Contignata* refers to structures made of planks or formed by wooden beams joined in a simple way. The fundamental requirement that no nails or fastening hardware be used (*neque ferro fixa*) responds to a defensive tactic: to allow the planks to be removed or destroyed (*rescindent*) instantly.
- ***qui repugnabunt rescindent:*** The verb *rescindere* implies a physical action of force: cutting, chopping, or dismantling. Vitruvius details the emergency protocol of the defending garrison (*qui repugnabunt*): by isolating the compromised section of wall through the removal of the timbers, the enemy

is trapped in a sealed sector, flanked by projectiles and with no other option than to retreat or jump into the ditch (*nisi se voluerit praecipitare*).

1.5.4 The distance between defensive towers should be defined according to the maximum range of an arrow, allowing light artillery or scorpions (*scorpionibus*) stationed on the flanks to repel the enemy. Furthermore, to prevent an attacker who has scaled the wall from progressing along the parapet, passage through the towers should be interrupted by movable wooden walkways without fixed fittings (*neque ferro fixa*). In case of assault, the defenders can quickly dismantle or destroy these planks (*rescindent*), isolating the enemy and halting their advance through the rest of the fortified complex (Vitruvius, *De architectura* 1.5.4).

Latin text

1.5.5 *Turres itaque rotundae aut polygonoe sunt faciendae. Quadratas enim machinae celerius dissipant, quod angulos arietes tundendo frangunt; in rotundationibus autem, uti cuneos ad centrum adigendo, laedere non possunt. Item munitiones muri turriumque aggeribus coniunctae maxime sunt tutiores, quod neque arietes neque suffossiones neque machinae ceterae eis valent nocere.*

1.5.5 The towers, therefore, should be built round or polygonal; for siege-engines dismantle square towers the more readily, since the rams shatter the corners by their battering, whereas in rounded forms, driving the stones towards the center as if with wedges, they can do no harm. Likewise, fortifications of wall and towers joined with earthworks are by far the safest, since neither rams nor mining nor the other engines have power to injure them. [124]

Academic translation

1.5.5 Consequently, towers should be built with a circular or polygonal plan. Indeed, siege engines destroy square towers more quickly because battering rams break the corners by repeatedly striking them; conversely, they fail to cause damage to circular structures, since the impacts are distributed towards the center of the curve in a manner similar to how voussoirs or wedges (*cunei)* act. Likewise, fortifications where the curtain walls and towers are reinforced by

124 The preference for circular or polygonal towers is explained within the siege technology known to Vitruvius, especially the impact of a battering ram on projecting corners. It is not a universal structural law.

earthworks (*aggeres*) are extremely secure, since neither battering rams, nor underground mining, nor any other siege engine can inflict any damage on them.

Notes (Explanation of Vitruvius's Text)

1. Marcus Vitruvius Pollio, De *architectura* 1.5.5. For paleographic variants on the physical simile of the wedges (*cuneos*), see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 19; and the fixation of the text of Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 19.

- Vitruvius sets forth a fundamental rule of ancient siege warfare: the structural weakness of 90 ° angles against mechanical artillery and *battering* rams. A protruding corner concentrates the stresses of the impact and lacks adjacent lateral supports, which facilitates the collapse of squared masonry ***blocks***.
- *uti cuneos ad centrum adigendo:* An application of the physics of arches and vaults to vertical defense. Vitruvius argues that a cylindrical tower reacts to the impact of a battering ram like a horizontal relieving arch: striking the convex surface, the force is deflected and distributed radially towards the central axis (ad centrum), pressing the stones together like the voussoirs or wedges (cunei) of a vault, and so dissipating the kinetic energy of the enemy engine.
- ***aggeribus coniunctae:*** The *agger* was a traditional defensive element of Roman military engineering, consisting of a massive earthen ramp or embankment supported against the inner face of the wall. By filling the interior space with compacted earth, the outer stone wall gained colossal inertia, absorbing the vibrations of battering ram blows without cracking.
- ***Suffossiones:*** A technical term for underground **mining or undermining work**. It consisted of excavating tunnels beneath the foundations of the wall, temporarily shoring them up with wooden beams which were then set on fire to cause the wall to collapse under its own weight. The presence of a large earthen embankment (agger*)* discouraged these operations, as the massive weight of the structure caused the attackers' galleries to collapse before reaching the core of the fortification.

1.5.5 Fortified towers should have circular or polygonal plans, since square plans are vulnerable to battering rams that fracture their corners. In curved

structures, impacts dissipate radially towards the center of the construction in a manner identical to the pressure between the wedges (*cunei*) of an arch. The security of the perimeter is substantially increased if the walls are combined with earth embankments (*aggeres*), a hybrid system that neutralizes both artillery vibrations and underground mining tactics (suffossiones*)* (Vitruvius, *De architectura* 1.5.5).

Critical Interlineation

Explanatory note: round towers and the fracture of angles. Vitruvius's preference for round or polygonal towers over square ones (1.5.5) rests on a structural and ballistic principle: the ram and the siege engines concentrate their blow upon the corners, where the masonry, lacking mass to distribute the impact, splinters and collapses quickly. On a curved surface, by contrast, the blocks are wedged towards the center and the blow is dispersed tangentially, so that the stone cannot easily be dislodged. The same reasoning—avoiding the weak point of the angle—recurs in the rounded circuit of the walls, which moreover removes the dead angles and allows the assailant to be watched from several flanks.

1.5.6 *Sed non in omnibus locis est aggeris ratio facienda, nisi quibus extra murum ex alto loco plano pede accessus fuerit ad moenia oppugnanda. Itaque in eiusmodi locis primum fossae sunt faciendae latitudinibus et altitudinibus quam amplissimis, deinde fundamentum muri deprimendum est infra alveum fossae et id extruendum est ea crassitudine ut opus terrenum facile sustineatur.*

1.5.6 A rampart, however, need not be raised in every place, but only where, outside the wall, there is level approach from higher ground for an assault upon it. In such places, first let ditches be dug as broad and deep as possible; then let the foundation of the wall be sunk within the bed of the ditch and built of such a thickness that it may readily bear the weight of the earthwork.

Plano pede. "On level ground", or "over accessible ground without a substantial change of level". It describes the attacker's access from outsi*de*; *no precise* topographical height relative to the wall top is established here.

Academic translation

1.5.6 However, the use of the earthwork (agger*)* should not be implemented indiscriminately anywhere, but only in those locations where, outside the walls and from a rise in the terrain, access for assaulting the fortifications can be made

at ground level (*plano pede*). Therefore, in such locations, ditches should first be excavated with the greatest possible width and depth; next, the foundations of the wall should be deepened within the bed or channel of the ditch itself (*intra alveum fossae*), and the retaining wall should be erected with a thickness that is capable of easily counteracting the thrust of the mass of earth.

Notes (Explanation of Vitruvius's Text)

2. Marcus Vitruvius Pollio, De *architectura* 1.5.6. For the fixation and interpretation of retaining wall engineering in antiquity, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 19-20; and Fritz Krohn's review, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 19-20.

- ***Not in all places... except where:*** Vitruvius demonstrates his flexibility as an engineer by rejecting universal construction recipes. The internal embankment (agger*)* requires an enormous movement of earth and urban space; therefore, it is only justified if the external topography presents a plateau or hill that negates the advantage of the height of the wall itself.
- ***plano pede: A Latin*** expression that literally means **"on level ground"** or "at ground level." It describes the tactical scenario in which an attacker, taking advantage of a natural elevation outside at the same level as the top of the wall, does not need to climb with ladders, but can charge in a straight horizontal line against the defenses.
- ***Intra alveum fossae:*** The *alveus* is the channel, bed, or excavated bottom. Vitruvius prescribed that the foundations of the wall should not stop at the level of the surface of the ditch, but rather extend **below the floor of the ditch itself**. This prevented enemy sappers from undermining the base of the wall from inside the ditch by eroding the lower stones.
- ***ut opus terrenum facile sustineatur:*** Vitruvius here formulates the primitive principles of **earth retaining wall** engineering. The inner face of the wall must act as a buttress capable of withstanding the active lateral thrust exerted by the large mass of earth accumulated in the *agger*, preventing failures due to overturning or sliding of the masonry.

1.5.6 The construction of an embankment (*agger*) is only necessary when the enemy has level access (*plano pede*) from an external elevation. In these vulnerable sectors, ditches of maximum dimensions must be excavated and the

foundations of the wall sunk directly below the bed of the ditch (*intra alveum fossae*). The thickness of this lower wall must be specifically dimensioned to resist the lateral thrust of the accumulated mass of earth (Vitruvius, *De architectura* 1.5.6).

3. Rowland and Howe, *Vitruvius*, 29.

Latin text

1.5.7 *Item interiore parte substructionis fundamentum distans ab exteriore introrsus amplo spatio, ita uti cohortes possint quemadmodum in acie instructae ad defendendum supra latitudinem aggeris consistere. Cum autem fundamenta ita distantia inter se fuerint constituta, tunc inter ea alia transversa, coniuncta exteriori et interiori fundamento, pectinatim disposita, quemadmodum serrae dentes solent esse, conlocentur. Cum enim sic erit factum, tunc ita oneris terreni magnitudo distributa in parvas partes neque universa pondere premens ⟨non⟩ poterit ulla ratione extrudere muri substructiones.*

1.5.7 On the inner side of the substructure, likewise, let a further foundation be laid at a generous distance from the outer, so that cohorts may take their stand upon the breadth of the rampart, drawn up as if in line of battle to defend it. And when the two foundations have been set thus apart, let other foundations be laid between them, joining the outer to the inner and arranged comb-wise, after the manner of the teeth of a saw. For when this is done, the great mass of earth, distributed into small portions and no longer bearing down with its whole weight, will by no means be able to thrust out the substructures of the wall.

Academic translation

1.5.7 Likewise, on the inner side of the substructure, a second foundation must be constructed, separated from the outer foundation towards the city center by a considerable distance, so that the military cohorts, deployed in battle formation (*in acie instructae*) for defense, can be stationed across the entire width of the embankment (agger*)*. Once both foundations are in place at this distance from each other, other transverse walls must be interwoven between them to connect the outer and inner foundations, arranged in a comb-like pattern (*pectinatim*) resembling the teeth of a saw. When the work is carried out according to this design, the colossal magnitude of the earth pressure is fragmented and distributed in small sections; thus, by preventing the weight

from acting as a compact and uniform mass, the pressure will in no way be able to push outwards or destabilize the retaining walls of the rampart.

Notes (Explanation of Vitruvius's Text)

1. Marcus Vitruvius Pollio, De *architectura* 1.5.7. For the geometric fixation of retaining walls with internal buttresses, see the critical edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 20; and Fritz Krohn's review, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 20.

- ***cohorts... in acie instructae:*** Vitruvius links the geometric scale of the inner earthwork (agger*)* with the logistical needs of Roman military tactics. The width of the upper part of the structure is not calculated randomly, but to allow the operational deployment of **entire cohorts in battle formation** (*acies*). This ensured rapid maneuverability and rotation of fresh troops during a mass assault on the engaged sectors.
- ***pectinatim disposita / serrae dentes: A*** famous passage from ancient structural engineering. Vitruvius describes the construction of **internal transverse buttress walls** arranged in parallel or "comb-like" (*pectinatim*), joining the exposed outer face of the wall with the internal retaining wall. The simile with the teeth of a saw (*serrae dentes*) visually illustrates how these perpendicular walls created independent structural cells or boxes.
- Vitruvius empirically formulates the principle of the **fragmentation of lateral earth pressures**. By filling the spaces formed by the transverse walls with earth, the friction of the earth mass against the interior masonry walls reduces the overall active thrust. The mass no longer ***presses*** monolithically (*neque universa pondere premens*), but rather the weight is broken down and absorbed by the stone buttresses.
- ***Extrudere muri substructiones:*** The verb *extrudere* denotes the action of pushing out, displacing, or bursting. In ancient soil mechanics, the main danger of large fills of clayey or humic soil was the failure of the retaining wall by **overturning or basal sliding**. The intricate network of double foundations and comb walls physically prevented this type of structural collapse.

1.5.7 To consolidate the embankment (agger), a second inner foundation will be erected at a distance that allows the tactical deployment of

military cohorts in battle formation (in acie instructae). Both foundations will be intertwined by perpendicular transverse walls in the shape of a comb (pectinatim), similar to the teeth of a saw. This structural solution fragments the active thrust of the earth fill into smaller sections, preventing the mass from exerting a hydrostatic or monolithic pressure capable of overturning or displacing (extrudere) the substructures of the fortification (Vitruvius, De architectura 1.5.7).

Latin text

1.5.8 *De ipso autem muro e qua materia struatur aut perficiatur, ideo non est praefiniendum, quod in omnibus locis quas optamus copias, eas non possumus habere. Sed ubi sunt saxa quadrata sive silex seu caementum aut coctus later sive crudus, his erit utendum. Non enim uti Babylone abundantes liquido bitumine pro calce et harena ex cocto latere factum habent murum, sic item possunt omnes regiones seu locorum proprietates habere tantas eiusdem generis utilitates, uti ex his comparationibus ad aeternitatem perfectus habeatur sine vitio murus.*

1.5.8 As to the material of which the wall is to be built or finished, no fixed rule can be laid down, since we cannot everywhere command the resources we should wish. But wherever there are squared stones, or flint, or rubble, or fired or unfired brick, these are to be used. For not every region or locality can possess advantages of the same kind in such measure as Babylon, which, abounding in liquid bitumen in place of lime and sand, has its wall built of fired brick; yet from such resources as each affords, a wall may be made faultless and enduring for all time.

Academic translation

1.5.8 As regards the material with which the wall itself is to be built and finished, it is not possible to establish a fixed rule, since we cannot always have the materials we would like available in every place. On the contrary, wherever there is regular ashlar (*saxa quadrata*), flint (*silex*), rubble (*caementum*), or brick — whether fired (*coctus*) or unfired (*crudus*) —they should be used. Indeed, not all regions or local ecosystems possess the extraordinary material advantages found, for example, in Babylon, where the abundance of liquid bitumen, used in place of lime and sand, made it possible to erect a wall of fired brick; therefore, it cannot be expected that by such analogies a perfect and imperishable wall can be achieved in every location.

Notes (Explanation of Vitruvius's Text)

1. Marcus Vitruvius Pollio, De *architectura* 1.5.8. For the textual tradition of the regional materials and the mention of the Babylonian walls, see Valentin Rose's edition, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 20; and Fritz Krohn's revision, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 20.

- ***non est praefiniendum... copiae:*** Vitruvius here states the principle of **material autarky or** adaptation to the geological environment. The Roman architect and engineer should not impose an abstract theoretical design, but rather critically evaluate the resources of the quarry and the local deposits (*copiae*). The economy of transport in the ancient world made the large-scale importation of stone for perimeter fortifications unfeasible.
- ***Saxa quadrata / flint / caementum:*** Typological classification of stone in Roman construction. *Saxa quadrata* are perfectly squared ashlar blocks with parallel faces, typical of monumental architecture. Flint *refers to extremely hard stones, such as flint or* basaltic volcanic rocks (frequently used in roads and foundations). *Caementum* designates rubble masonry, fragmented and irregular stones that were joined with mortar to form the core of the wall (*opus caementicium*).
- ***coctus later sive crudus:*** Vitruvius equates the use of industrialized clay. *Later crudus* (adobe or sun-dried brick) remained common in domestic architecture and secondary walls of the Republican periphery, while *later coctus* (kiln-fired brick) represented maximum resistance to compression and humidity.
- ***Babylon... liquid bitumen for lime:*** Historical mention of the Mesopotamian construction technique, also documented by Herodotus. Babylon lacked limestone quarries for making lime (*calx*) and suitable sand (*harena*), but it had natural outcrops of asphalt or bitumen from Hit. This viscous hydrocarbon acted as a fast-setting mortar and waterproofing agent with exceptional adhesion, fixing the courses of fired brick against river floods. Vitruvius classifies it as a fortunate geographical anomaly (*locorum proprietates), inapplicable to* the soil of the Italian peninsula.

1.5.8 It is not possible to prescribe a universal material for the construction of walls, since the suitable resources vary according to the region. The architect will

use the materials available in the surroundings, whether they be regular ashlar blocks (*saxa quadrata*), basalt or flint (*silex*), common masonry (*caementum*), or fired or unfired brick. The exceptional conditions of Babylon, where liquid bitumen (*liquido bitumine*) effectively replaced the traditional mixture of lime and sand, constitute a unique geographical advantage that cannot be demanded as a norm in other territories (Vitruvius, *De architectura* 1.5.8).

Comparative critical apparatus — I.5. The chapter has been compared with Krohn and with the organization and commentary of Philippe Fleury's Budé edition. In I.5.1 the modern critical text marks [erit] and [moenium conlocandorum explicatio] as problematic, and prints marinae subvectionis habuerit where other traditions and normalizations offer marinae subvectiones habuerint. In I.5.2 the readings scaeva and circumdandum/circundandum belong to the transmission and should not be reduced to mere spelling variants. In I.5.7 the simile pectinatim, quemadmodum serrae dentes describes the transverse bonding of the substructures: the comparison explains a constructional arrangement rather than a decorative motif.

Architectural and military note — I.5. The prescriptions for projecting towers, oblique approaches, wall thicknesses, earthworks and cross-walls follow an ancient defensive logic. The edition avoids making them universal rules of fortification: Vitruvius reasons in terms of rams, missiles, shields, scorpions and the siege techniques of his historical setting.

Comparative apparatus — I.5. Fortification requires foundations on firm ground, proportionate thicknesses, projecting towers and layouts that hinder a frontal assault. Agger, fossa, murus, turris, intervallum and emplecton are checked according to their constructional functions. The military recommendations are discussed historically rather than as contemporary instructions.

Construction note — Walls and towers. The explanation for architects distinguishes foundations, wall mass, transverse bonding and tower position. Claims about the durability of materials are retained in their Roman context, rather than converted without evidence into present structural prescriptions.

Chapter 6

Latin text

1.6.1 *Moenibus circumdatis sequuntur intra murum arearum divisiones platearumque et angiportûm ad caeli regionem directiones. Dirigentur haec autem recte, si exclusi erunt ex angiportis venti prudenter. Qui si frigidi sunt, laedunt; si calidi, vitiant; si umidi, nocent. Quare vitandum videtur hoc vitium et avertendum ne fiat quod in multis civitatibus usu solet venire. Quemadmodum in insula Lesbo oppidum Mytilenae magnificenter est aedificatum et eleganter, sed positum non prudenter. In qua civitate Auster cum flat, homines aegrotant; cum Corus, tussiunt; cum Septentrio, restituuntur in salubritatem, sed in angiportis et plateis non possunt consistere propter vehementiam frigoris.*

1.6.1 Once the walls have been built, there follow, within them, the apportionment of the building plots and the laying-out of the streets and lanes according to the quarters of the sky. These will be rightly directed if the winds are prudently excluded from the lanes; for if they are cold they are hurtful, if hot they enervate, if damp they are noxious. This fault, then, must be avoided, and care taken lest there befall what commonly happens in many cities. At Mytilene, for instance, in the island of Lesbos, the town is built with magnificence and elegance, but sited without prudence: in that city, when the south wind blows the people fall ill; when the north-west wind blows they cough; and when the north wind blows they are restored to health, yet cannot linger in the lanes and streets because of the sharpness of the cold.

Critical textual note — I.6.1. This edition uses the normalized spelling *sequuntur*. *Krohn (1912, 20, line 7*) prints sequuntur in his text; Rose (1899, 22, line 5) prints secuntur. Both apparatuses report *secuntur* for H, identified as Harley MS 2767 in their lists of sigla. The Spanish note's statement that Krohn prints secuntur in the running text is therefore corrected. The forms belong to *sequor*, third-person plural, and the difference is orthographic. The attribution to H is reported from these printed apparatuses, not from a new direct collation of the manuscript.

Academic translation

1.6.1 Once the perimeter of the walls is completed, the parcelling of building plots (*areae*) and the alignment of the main streets (*plateae*) and alleyways (*angiporta)* within the enclosure will proceed according to the celestial

directions. This street layout will be correctly oriented only if the entry of winds into the alleyways is prevented by prudent design. Indeed, if the winds are cold, they cause illness; if they are warm, they pollute the atmosphere; and if they are humid, they are harmful. Therefore, this defect must be avoided, and care must be taken to prevent what often happens in many cities, such as Mytilene, a town on the island of Lesbos, which was built with magnificence and elegance but situated without foresight. In that city, when the Auster (south wind) blows, the inhabitants fall ill; When the Corus (north-west wind) blows, they suffer from coughs; and when the Septentrion (north wind) blows, they regain their health, although it is impossible for them to remain in the streets and alleys due to the vehemence of the cold.

Notes (Explanation of Vitruvius's Text)

1. Marcus Vitruvius Pollio, De *architectura* 1.6.1. For the fixation of the spelling variants and the medical description of the climate in Lesvos, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 20-21; and Fritz Krohn's review, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 20-21.

- ***Arearum divisiones platearumque et angiportorum:*** Vitruvius establishes the hierarchy of Roman urban planning (*spatial units*). The *areae* are the plots intended for dwellings or public buildings; the *plateae* are the main avenues, wide and for general traffic; the angiporta *are the secondary alleys or* narrower passages. The author subordinates the geometry of the entire urban network to a climatic factor: the aerodynamics of the wind.
- ***ad caeli regionem directiones:*** The road layout is not drawn randomly or solely according to aesthetic criteria. It must be aligned with the "celestial regions" (the cardinal points and the solar paths), a principle that united surveying and astronomy to regulate lighting and air currents within the orthogonal grid.
- ***Auster / Corus / Septentrio:*** Vitruvius applies the theory of classical medical winds. The Auster is *the* humid and warm south wind, associated in Hippocratic medicine with the dispersion of dense humours and fevers; the *Corus* (northwest wind) is dry and violent, causing inflammatory respiratory conditions (*tussiunt*); the *Septentrio* (north wind) purified the air of cities by

expelling miasmas, promoting health, but required architectural protection due to its extreme temperatures.

- ***Mytilene... sed positum non prudenter:*** Vitruvius uses Mytilene (capital of Lesbos) as a technical counterexample. He acknowledges its formal and constructive values (*magnificer... et eleganter*), but criticizes its bioclimatic design flaw. By aligning the alleyways directly with the prevailing winds, the streets acted as wind tunnels or funnels that amplified the harshness of the local climate, harming health and the use of public space (non *possunt constantere*).

1.6.1 Once the walls were completed, the division of building plots (*areae*) and the layout of avenues (*plateae*) and alleyways (*angiporta*) should be oriented according to the regions of the sky to block the prevailing winds. Vitruvius warns about the physiological effects of the climate: hot winds corrupt and humid ones damage. Formally beautiful cities like Mytilene erred in aligning their streets with the winds, causing the South Wind (*Auster*) to cause illness and the north-west wind (*Corus*) respiratory ailments, demonstrating that urban aesthetics must be subordinated to environmental hygiene (Vitruvius, *De architectura* 1.6.1).

Latin text

2. *Ventus autem est aeris fluens unda cum certa motus redundantia. Nascitur, cum fervor offendit umorem et impetus spiritus factionis exprimit vim flatus. Id autem verum esse ex aeolis aereis licet aspicere et de latentibus caeli rationibus artificiosis rerum inventionibus divinitatis exprimere veritatem. Fiunt enim aeoli pilae aereae cavae, — hae habent punctum angustissimum—quae aqua infunduntur conlocanturque ad ignem; et antequam calescant, non habent ullum spiritum, simul autem ut fervere coeperint, efficiunt ad ignem vehementem flatum. Ita scire et iudicare licet e parvo brevissimoque spectaculo de magnis et inmanibus caeli ventorumque naturae rationibus.*

1.6.2 Wind is a flowing wave of air with a certain excess of motion. It arises when heat meets moisture and the impulse generated in producing breath forces out the power of the blast. This can be observed in bronze aeolipiles, through ingenious devices that reveal the truth of the hidden workings of the heavens. Hollow bronze spheres are made with a very narrow opening, filled with water and set beside a fire. Before they grow hot they give off no breath; as soon as they begin to boil, they produce a violent blast towards the fire. From a small and

very brief demonstration, one may thus learn and judge the great and immense principles governing the heavens and the nature of the winds.[125]

Aeolipilis aereis / aeolis aereis] The former wording occurs in Rose's printed text (1899, 22); Krohn (1912, 20) prints aeolis aereis and subsequently aeoli pilae aereae cavae. The familiar term aeolipile combines Aeolus with pila, "sphere". Vitruvius describes a hollow bronze vessel with a narrow opening. These differences are recorded as editorial wordings rather than collapsed into an unverified general claim about manuscript spelling.

Notes (Explanation of Vitruvius's Text)

Marcus Vitruvius Pollio, De *architectura* 1.6.2. Compare Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 22–23, and Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 20–21. Both print scire in the relevant sentence. The earlier attribution of a correction seire/scire to a particular codex was not documented and is not asserted here.

- ***Aeris fluens unda.*** A "wave" or current of moving air. The comparison is physical and descriptive; it should not be presented as a rigorous formulation of fluid dynamics in the modern sense.
- ***Cum fervor offendit umorem***. Vitruvius explains the origin of wind through the meeting of heat and moisture within his ancient physics. That conceptual framework should be retained without calling *it "thermodynamics"*.
- ***Artificiosis rerum inventionibus.*** Technical inventions permit the inference of nature's hidden principles, according to Vitruvius. The passage presents an experimental analogy, but should not be described without qualification as a "laboratory model" in the modern methodological sense.
- ***Punctum angustissimum... vehementem flatum.*** The sphere has a very narrow opening and expels a strong blast when the water boils. The description can be explained through the production of steam, but the text does not formulate the modern principles of mass conservation or a "nozzle effect".

E parvo... de magnis et inmanibus. Vitruvius starts from a small-scale phenomenon to explain a larger one. The procedure is best described as an

125 The aeolipile is used here to demonstrate the action of heat on water and the resulting flow of air, in support of Vitruvius's account of the winds (1.6.2).

explanatory analogy, without projecting on to the passage a doctrine of symbolic reading and cosmic order that the text does not formulate.

- e ***parvo... de magnis et inmanibus:*** The author explains the analytical method of the **microcosm versus the macrocosm**. The observation of a domestic and controlled phenomenon allows the architect to deduce the general laws of atmospheric physics (*caeli ventorumque naturae rationibus*), essential knowledge for the bioclimatic design of cities.

1.6.2 Wind is defined as a wave of flowing air caused by the impact of heat on moisture, expanding the vapor. This thermodynamic law is verified experimentally by the use of bronze aeolipiles (aeolipilis *aereis*), hollow spheres with a narrow conduit which, when filled with water and exposed to fire, project a violent jet of vapor as soon as the liquid boils. This reduced-scale model empirically illustrates the physics of the great and immeasurable meteorological phenomena of the firmament (Vitruvius, *De architectura* 1.6.2).

Critical Interlineation

3. *⟨Venti autem si ex habitationibus⟩ exclusi fuerint, non solum efficient corporibus valentibus locum salubrem, sed etiam si qui morbi ex aliis vitiis forte nascentur, qui in ceteris ⟨minus⟩ salubribus locis habent curationes medicinae contrariae, in his propter exclusiones ventorum temperatura expeditius curabuntur. Vitia autem sunt, quae difficulter curantur in regionibus, quae sunt supra scriptae, haec: gravitudo arteriace, tussis, pleuritis, pthisis, sanguinis eiectio et cetera, quae non detractionibus sed adiectionibus curantur. Haec ideo difficulter medicantur, primum quod ex frigoribus concipiuntur, deinde quod defatigatis morbo viribus eorum aer agitatus est ⟨molestus; namque ubi⟩ ventorum agitationibus extenuatur, a vitiosis corporibus detrahit sucum et efficit ea exiliora. Contra vero lenis et crassus aer, qui perflatus non habet neque crebras redundantias, propter inmotam stabilitatem adiciendo ad membra eorum alit eos et reficit, qui in his sunt inpliciti morbis.*

1.6.3 If the winds are excluded from dwellings, they will not only make the place healthy for sound bodies; should diseases happen to arise from other causes, which in other, less healthy places require contrary medical treatment, they will be cured more readily here through the temperate conditions produced by excluding the winds. The ailments difficult to cure in the regions described above are heaviness of the windpipe, cough, pleurisy, consumption, the spitting

of blood, and the others treated by additions rather than subtractions. They are difficult to treat first because they arise from cold, and then because moving air troubles those whose strength has been exhausted by disease: where the air is thinned by the agitation of the winds, it draws moisture from diseased bodies and makes them more wasted. Mild, dense air, by contrast, free from draughts and frequent surges, by its unmoving stability nourishes and restores the limbs of those afflicted by these diseases.

Textual note — I.6.3. ***Rose (1899, 23) prints the restoration <igitur venti si ex habitationibus>*** at the opening of the section; Krohn (1912, 21) prints <Venti autem si ex habitationibus>. The Spanish note states that Rose's restoration is adopted, but the Spanish edition's running Latin follows the latter wording. The text printed here follows the authorial Spanish edition's running Latin and records the editorial difference. Editorial unanimity must not be asserted where reconstructions of the lacuna differ.

Notes (Explanation of Vitruvius's Text)

3. Marcus Vitruvius Pollio, De *architectura* 1.6.3. For the philological analysis of Aeolian medical terminology and the gaps in the main manuscripts, see Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 21-22; and Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 21-22.

- ***Medicinae contrariae / temperaturam:*** Vitruvius adopts the postulates of the Hippocratic treatise **On Airs**, *Waters, and Places*. Temperature *in* Vitruvian Latin is not the modern quantitative measurement, but the notion of climatic **equilibrium and proportion**. If the urban fabric slows down air currents, a protected microclimate is generated that optimizes bodily homeostasis.
- ***Gravedo, arteriace...: Ancient*** symptomatology of respiratory ailments. *Gravedo* defines heavy nasal congestion or coryza; arteriace *is* a medical Hellenism that designates the inflammation of the *arteria aspera* (the trachea and bronchi, not the blood arteries); *phthisis* represents obstructive pulmonary consumption or tuberculosis; and *sanguinis eectio* is the expulsion of blood through the respiratory tract (hemoptysis).
- ***Non detractionibus sed adiectionibus: A fundamental*** therapeutic concept of Galenic and Hippocratic medicine. Bodies suffered from

ailments due to excess (*plethora*) or deficiency. Diseases requiring detractions *(*evacuations, bloodletting, or purges) were those caused by excess humours. In contrast, chronic pulmonary pathologies generated malnutrition and physical deterioration, thus requiring adiectione*s:* therapies of **reconstitution, rest, warmth, and nutrition**.

- ***aer agitatus... detrahit sucum:*** Vitruvius offers a microclimatic explanation based on physical evaporation. The air agitated by the wind becomes thinner or more subtle (*extenuatur*) and acts by increasing the rate of perspiration and drying of the patient's mucous membranes. By stripping away the *sucus* (the bodily juices or fluids that maintained the flexibility and defense of the tissues), the wind accelerates the emaciation or malnutrition (*exiliora*) of the patients.
- ***lenis et crassus aer:*** The paradox of "thick or dense air." While modern urban planning prioritizes constant ventilation, ancient science considered that still, warm, and dense (*crassus*) air inside sheltered alleyways acted as a physical balm for damaged lungs. Lacking turbulence (*perflatus*), this stable air provided an environmental rest that allowed the body to absorb nutrients and recover lost energy.

1.6.3 The exclusion of winds in urban design generates optimal thermal stability (temperature*)* for the recovery from chronic respiratory pathologies, such as catarrh (*gravedo*), bronchitis (*arteriace*), tuberculosis (*phthisis*), and hemoptysis. Since these diseases require restorative therapies (*adictiones*) rather than evacuation therapies, dynamic and agitated air is detrimental because it accelerates dehydration and loss of vital fluids (*sucum*) in the patient. Conversely, dense, stable air free of drafts (*crassus aer*) nourishes and restores weakened organisms (Vitruvius, *De architectura* 1.6.3).

4. Rowland and Howe, *Vitruvius*, 29-30.

Critical Interlineation

1.6.4 *Nonnullis placuit esse ventos quattuor: ab oriente aequinoctiali Solanum, a meridie Austrum, ab occidente aequinoctiali Favonium, ab septentrionali Septentrionem. Sed qui diligentius perquisierunt tradiderunt eos esse octo, maxime quidem Andronicus Cyrrestes, qui etiam exemplum conlocavit Athenis turrem marmoream octagonon et in singulis lateribus octagoni singulorum ventorum imagines excalptas contra suos cuiusque flatus designavit, supraque*

eam turrim metam marmoream perfecit et insuper Tritonem aereum conlocavit dextra manu virgam porrigentem, et ita est machinatus uti vento circumageretur et semper contra flatum consisteret supraque imaginem flantis venti indicem virgam teneret.

Archaeological note — Bk. 1.6 (the winds and the Tower of the Winds). The layout of the city, Vitruvius says, must orient the streets by the winds: along the lines dividing the eight winds —Solanus (E), Auster (S), Favonius (W), Septentrio (N) and, at the corners, Eurus (SE), Africus (SW), Caurus or Corus (NW), and Aquilo (NE)— so that no street channels the wind against the houses. Against those who counted only four winds, Vitruvius praises those who recognized eight, and cites as a living witness Andronicus of Cyrrhus, who raised at Athens an octagonal marble tower with a figure of each wind on its face and, at the apex, a bronze Triton turning to point to the quarter from which the wind blew. This is the Tower of the Winds (Horologion) in the Roman Agora of Athens (c. 50 BCE), of Pentelic marble, with nine sundials and a water-clock within: one of the very few buildings of classical antiquity to survive almost intact —and one that links this chapter to the gnomonics of Book IX.

Archaeological note — I.6.4. Vitruvius contrasts a division into four winds with one into eight, citing the octagonal tower of Andronicus of Cyrrhus at Athens, decorated with personifications of the winds and crowned, according to his description, by a bronze Triton that turned with the wind. The surviving monument confirms the octagonal plan and wind reliefs; the bronze weather-vane does not survive.

1.6.4 Some have held that there are four winds: Solanus from the equinoctial east, Auster from the south, Favonius from the equinoctial west and Septentrio from the north. Those who investigated more carefully, however, stated that there are eight, notably Andronicus[126] of Cyrrhus. As an example he erected an octagonal marble tower at Athens, with an image of each wind carved on the face corresponding to the direction from which it blows. He completed the

126 The so-called Tower of the Winds at Athens, attributed to Andronicus of Cyrrhus, is a Hellenistic octagonal building associated with representations of eight winds. Vitruvius uses it as material support for his anemological system.

tower with a marble cone and placed above it a bronze Triton extending a rod in his right hand. The mechanism allowed the Triton to turn with the wind, face the incoming current and hold the rod above the image of the wind that was blowing.[127]

1. ***turrim marmoream octagonon:*** Known archaeologically as the Horologium of Andronicus of Cyrrhus or the "Tower of the Winds" at Athens (c. 1st century BC). Vitruvius used the quote as the *exemplum* (physical model or archetype) to justify the transition from the four - partite to the octagonal system in urban planning.

Academic translation

1.6.4 Some authors have determined that there are only four winds: the Solano, which blows from the east; the Austro, from the south; the Favonius, from the west; and the Septentrion, from the north. However, those who investigated this matter more rigorously have transmitted that there are eight winds, Andronicus of Cyrrhus being a prominent example. This astronomer erected in Athens, as a practical model, an octagonal marble tower on whose faces he sculpted the images of each of the winds, oriented towards the direction of their respective blows; on top of this tower he placed a conical marble structure (*meta*) and at its summit a bronze Triton extending a rod in his right hand. The mechanism was ingeniously designed so that the Triton rotated by the action of the wind, always stopping facing the current that blew, so that its rod pointed, like an index finger, directly over the effigy of the corresponding wind.

Notes (Explanation of Vitruvius's Text)

2. Marcus Vitruvius Pollio, De *architectura* 1.6.4. For the comparison of the epigraphic and monumental lessons of the Athenian tower with the Vitruvian text, see the critical edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 22; and Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 22.

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127 Vitruvius's account of the winds (1.6) begins with eight principal winds, associated with Andronicus of Cyrrhus and the Tower of the Winds at Athens. Streets laid along the bisectors of the octants are intended to exclude direct currents from their axes. At 1.6.10 he adds sixteen subsidiary names to the eight principal winds, giving a twenty-four-wind scheme. Compare Aristotle, Meteorologica 2.6, and Pliny, Natural History 2.119–121.

- ***East/West Equinoctiali:*** Vitruvius uses Roman astronomical terminology to pinpoint the exact cardinal directions. The *orient aequinoctiali* (equinoctial east) and *octenoctiali* (equinoctial west) refer to the points on the horizon where the sun rises and sets during the spring and autumn equinoxes, as distinct from the solstitial points (summer and winter). The associated primordial winds are the *Solanus* (east wind) and the *Favonius* (the Greek zephyr, west wind).
- ***Andronicus Cyrrestes:*** Andronicus of Cyrrhus (Syrian by origin), astronomer and mathematician of the 1st century BC. His tower in the Roman Agora of Athens combined a multiple sundial, an internal water clock (*clepsydra*) for cloudy days and the weathervane system described by Vitruvius, constituting a compendium of the sciences of astronomy and gnomonics of the time.
- ***Imagines excalptas contra suos flatus:*** The eight friezes sculpted in bas-relief at the top of the tower are still preserved. Each wind deity is represented anthropomorphically and flying, carrying specific climatic attributes and oriented exactly towards the geographical direction from which its wind originates (e.g., Boreas in the north, Notus in the south).
- ***metam marmoream:*** The *meta* refers to the conical or pyramidal shape that crowns the roof of the tower, constructed with interlocking Pentelic marble slabs. Its design imitated the meta of Roman circuses, serving as a solid and elevated base for the automaton's axis.
- ***Tritonem aereum... indicem virgam:*** The description of this **bronze Triton** represents the first historical record of an automated anemoscope or weathervane. The mythological marine figure functioned under simple static and aerodynamic principles: as the air current acted upon the Triton's tail or folds, it rotated on a central pivot until it offered the least resistance to the wind, aligning its torso and the indicator rod (*virga*) towards the exact quadrant from which the wind originated, pointing to the sculpted deity that generated it.

1.6.4 In contrast to the traditional theory of the four cardinal winds, Vitruvius adopted the scientific system of eight winds proposed by Andronicus of Cyrrhus. As empirical proof, Andronicus erected an octagonal marble tower in Athens with the effigies of the Aeolian deities sculpted on its respective faces. The monument was crowned by a bronze Triton (*Tritonem aereum*) which,

acting as a mechanical weathervane, turned with the wind and indicated with a rod the image of the prevailing wind (Vitruvius, *De architectura* 1.6.4).

Latin text

1.6.5 *Itaque sunt conlocati inter Solanum et Austrum ab oriente hiberno Eurus, inter Austrum et Favonium ab occidente hiberno Africus, inter Favonium et Septentrionem Caurus, quem plures vocant Corum, inter Septentrionem et Solanum Aquilo. Hoc modo videtur esse expressum uti pateat numerus et nomina et partes unde flatus certi ventorum spirent. Quod cum ita exploratum habeatur, ut inveniantur regiones et ortus eorum sic erit ratiocinandum.*

1.6.5 Thus Eurus lies between Solanus and Auster, blowing from the winter sunrise; Africus lies between Auster and Favonius, from the winter sunset; Caurus, which many call Corus, lies between Favonius and Septentrio; and Aquilo lies between Septentrio and Solanus. This defines the number and names of the winds and the quarters from which they blow. With that established, the following method will determine their directions and points of origin.

Academic translation

1.6.5 Eurus, the south-east wind, lies between Solanus (east) and Auster (south), at the winter sunrise. Africus, the south-west wind, lies between Auster (south) and Favonius (west), at the winter sunset. Caurus, more commonly called Corus, lies between Favonius (west) and Septentrio (north), in the north-west; Aquilo lies between Septentrio (north) and Solanus (east), in the north-east. This sets out their number, names and directions. To find their directions and points of origin on the ground, the following method must be used.

Notes (Explanation of Vitruvius's Text)

1. Marcus Vitruvius Pollio, De *architectura* 1.6.5. For the establishment of the aeolian nomenclature of the Italian secondary winds, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 22-23; and Fritz Krohn's review, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 22-23.

- ***Winter east/west:*** Vitruvius uses solstitial astronomical coordinates to subdivide the horizon. *Winter east* corresponds to the point on the horizon where the sun rises during the winter solstice (astronomical southeast); winter

west corresponds to the point where the sun sets on that same date (astronomical southwest).

- ***Eurus / Africus / Caurus / Aquilo:*** Definition of the four collateral directions that complete the octagonal system (*compass rose*):
    - **Euro (*Eurus*):** Southeast wind, located between east (*Solanus*) and south (*Auster*).

- **Africus:** Southwest wind, blew from the Roman province of **Africa** towards Italy, between the south (***Auster)*** and the west (*Favonius*).

- **Cauru (*Caurus* / *Corus*):** Wind from the northwest, between the west (*Favonius*) and the north (*Septentrio*). Vitruvius ascertains a fact of technical sociolinguistics: the dialectal phonetic form *Corus* was much more frequent (*plures vocant*) than the cultic or archaic term *Caurus*.

- **Aquilo:** Northeast wind, with cold and dry characteristics**,** located between the north (*Septentrio*) and the east (***Solanus)***.

- ***numbers, names, and parts:*** Taxonomic triad of scientific urbanism. Vitruvius demands that the architect assimilate the mathematical order (8 winds / quadrants of 45 °), the standardized Roman terminology, and the exact spatial delimitation (parts*)* of the horizon before drawing a single wall.

- ***sic erit ratiocinandum:*** *The term ratiocinandum* does not refer to mere theoretical reflection, but to the use of mathematical **reason and instrumental gnomonics**. In the following paragraphs, Vitruvius will mathematically explain the use of the *gnomon* to draw the exact meridian line, a rigorous geometric method that surpasses empirical estimations by eye.

1.6.5 The octagonal compass rose is completed by four intercardinal winds defined by the solstices: the Euro (*Eurus*) in the southeast or winter sunrise; the Africus (*Africus*) in the southwest or winter sunset; the Caurus or Corus (*Caurus/Corus*) in the northwest; and the Aquilo (*Aquilo*) in the northeast. This system precisely delimits the number, nomenclature, and quadrants of the wind currents. To transfer this abstract scheme to the urban plan and find the exact bearings on the ground, the architect must employ a method of gnomonic calculation (ratiocinandum) *(*Vitruvius, *De architectura* 1.6.5).

Critical Interlineation

1.6.6 *Conlocetur ad libellam marmoreum amusium mediis moenibus, aut locus ita expoliatur ad regulam et libellam ut amusium non desideretur, supraque eius loci centrum medium conlocetur aeneus gnomon indagator umbrae, qui graece σκιαθήρας dicitur. Huius antemeridiana circiter hora quinta sumenda est extrema gnomonis umbra et puncto signanda, deinde circino diducto ad punctum quod est gnomonis umbrae longitudinis signum, ex eoque a centro circumagenda linea rotundationis. Itemque observanda postmeridiana istius gnomonis crescens umbra, et cum tetigerit circinationis lineam et fecerit parem antemeridianae umbrae postmeridianam, signanda puncto.*

1.6.6 Let a marble plane be set level in the center of the city, or let the ground be smoothed with a straightedge and level so that a marble plane is unnecessary. Place a bronze gnomon, a shadow-tracer, at its center. At about the fifth hour of the morning mark the tip of the gnomon's shadow. With the compasses opened from the center to that mark, describe a circle. Then observe the growing shadow in the afternoon; when it touches the circle and equals the length of the morning shadow, mark that point as well.[128]

Greek note — I.6.6. Vitruvius calls the gnomon, indagator umbrae, by the Greek term σκιαθήρας. The manuscript tradition presents graphic variants; the edition normalizes the Greek form for ease of reading and retains the textual caution in the apparatus.

Academic translation

1.6.6 To begin, a perfectly polished circular marble surface (amussium) at the geometric center of the urban area must be precisely leveled using a level (libella)*;* or, alternatively, the ground may be smoothed and *leveled* with a straightedge and level so that such a marble platform is unnecessary. A bronze stylus (*gnomon*) for recording the shadow, called *a skiatheras in Greek,* is placed directly over the exact center of this space. At approximately the fifth hour of the morning (about two hours before solar noon), the end of the shadow cast by the gnomon is marked precisely with a point; then, opening a compass (*circinus*) from the center of the plane to the point indicating the length of this

128 Σκιαθήρας literally means "shadow hunter" or "shadow observer". The procedure using morning and afternoon shadows of equal length establishes a meridian line without using a magnetic compass.

morning shadow, a perfectly circular line is drawn from there. Likewise, it will be necessary to observe in the afternoon how the shadow of this same gnomon grows, and at the exact moment when the end of the shadow touches the line of the circle previously drawn — thus equalizing the length of the evening shadow with that of the morning —, this point of contact will be marked again.

Notes (Explanation of Vitruvius's Text)

2. Marcus Vitruvius Pollio, De architectura *1.6.6*. For the analysis of classical gnomonics applied to surveying and the restoration of Hellenism *skiatheras*, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 23; and the revision of Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 23.

- ***ad libellam / amussium:*** Vitruvius details the prior metrological requirements to avoid parallax errors. The *libella* is the Roman level, which could take the form of an A-shaped frame fitted with a plumb bob. The *amussium designates a perfectly worked and polished* marble table or slab with absolute flatness. The projection plane must be perfectly horizontal (0 °). (of inclination), since any difference in level would distort the symmetry of the solar shadows, distorting the geometric calculation of the north-south axis.
- ***Gnomon / Skiatheras:*** A gnomon is a rigid vertical rod or stylus perpendicular to the horizontal plane. Vitruvius introduces the specialized term from Alexandrian science, *skiatheras* ("the one who catches the shadow"), highlighting the gnomon's status as an analog device for capturing astronomical and spatial data.
- ***Antemeridiana circiter hora quinta: Vitruvius*** *prescribes a* specific time window for taking the first measurement. Since the Roman day was divided into 12 variable hours from sunrise to sunset, the *fifth hour* of the morning corresponds to the period immediately before noon (the solar zenith occurs exactly at the end of the sixth hour). During this time, the shadow of the gnomon is long and sharp enough to be indexed accurately, and its speed of movement allows for clear marking.
- ***Circinus diductus / linea rotundationis:*** The method of concentric **circles or** equal shadows. By drawing a circle taking as the exact radius the length of the shadow of the fifth hour of the morning**, Vitruvius** generates a geometric control arc based on the astronomical principle that the

sun occupies symmetrical positions with respect to the local meridian before and after noon.

Gnomon / σκιαθήρας. The gnomon is the vertical element that casts the shadow. Vitruvius explains its function through σκιαθήρας, "shadow tracker" or "shadow observer". The note does not assign the term to a particular "Alexandrian science" without an additional source.

Parem antemeridianae umbrae postmeridianam. The procedure uses two shadows of equal length, one before and one after midday, to establish a reference line. The note avoids attributing to the text a trigonometrical formulation that Vitruvius does not express.

- ***parem antemeridianae umbrae postmeridianam:*** The implicit trigonometric basis of the method. Throughout the day, the shadow of the gnomon describes a hyperbolic curve decreasing towards midday and increasing towards sunset. By intersecting the afternoon shadow with the morning circle, two vectors of equal length are obtained. The bisector of the angle formed by these two fixed points of shadow will invariably indicate the exact axis of midday (the true north-south line or astronomical meridian).

1.6.6 The layout of the road requires precisely leveling a horizontal surface (*amussium*) and installing a bronze stylus or gnomon (*skiatheras*) in its center. Around the fifth hour of the morning, the end of the shadow is marked with a point, and a circle is drawn using that distance as the radius. In the afternoon, when the shadow grows longer again and exactly intersects the drawn circle, a second point is marked, geometrically equating both solar longitudes (Vitruvius, *De architectura* 1.6.6).

3. Rowland and Howe, *Vitruvius*, 30.

Critical Interlineation

1.6.7 Ex his duobus signis circino decusatim describendum, et per decusationem et medium centrum linea perducenda ad extremum, ut habeatur meridiana et septentrionalis regio. Tum postea sumenda est sexta decima pars circinationis lineae totius rotundationis, centrumque conlocandum in meridiana linea qua tangit circinationem, et signandum dextra ac sinistra in circinatione et meridiana et septentrionali parte. Tunc ex signis his quattuor per centrum medium decusatim lineae ab extremis ad extremas

circinationes perducendae. Ita Austri et Septentrionis habebitur octavae partis designatio. Reliquae partes dextra ac sinistra tres et tres aequales his distribuendae sunt in tota rotundatione, ut aequales divisiones octo ventorum designatae sint in descriptione. Tum per angulos inter duas ventorum regiones et platearum et angiportorum videntur deberi dirigi descriptiones.

1.6.7 From the two shadow-marks draw intersecting arcs with the compasses. Through their intersection and the center draw a line to the circumference, establishing south and north. Take one-sixteenth of the entire circumference and, with the compasses centered where the meridian meets it, mark that distance on either side at both the southern and northern ends. From the four marks draw intersecting lines through the center from one side of the circle to the other. This defines one-eighth of the circle for Auster and one-eighth for Septentrio. Divide the remaining regions into three equal sectors on either side, completing the eight wind divisions. The lines of streets and lanes should run along the angles between two wind regions.

1. ***circino decussatim:*** The adverb *decussatim derives from the intersection in the shape of* an "X" (*decussis*, the Roman numeral ten). It describes the geometric technique of drawing two intersecting arcs with a compass to find the perpendicular bisector of a segment.

Academic translation

1.6.7 From these two points marked on the circumference, two arcs will be drawn with the compass, intersecting each other in a cross shape (*decussatim*). Then, by extending a straight line through both this point of intersection and the very center of the platform to the ends of the circumference, the exact orientation of the meridional (south) and septentrional (north) regions will be obtained. Subsequently, a measurement equivalent to one-sixteenth of the total perimeter of the circumference will be taken, and, placing the point of the compass at the point where the meridian line intersects the circumference, marks will be made to the right and left, repeating this same procedure at both the northern and southern ends. Next, from these four new marks, straight lines will be drawn crossing the center from one side of the perimeter to the other. In this way, an angular sector equivalent to one-eighth of the circumference (45 °) will be delimited for the South and another for the North. The remaining

regions — three to the right and three to the left — will be distributed symmetrically following this same proportion around the entire circle, thus completing the equal divisions corresponding to the eight winds on the plan. Finally, it is along the dividing angles between two wind regions that the layouts of the main streets (*plateae*) and alleyways (*angiporta)* must be aligned.

Notes (Explanation of Vitruvius's Text)

2. Marcus Vitruvius Pollio, De *architectura* 1.6.7. For the geometric reconstruction of the wind plane and the analysis of angular subdivision in ancient urban planning, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 23-24; and Fritz Krohn's review, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 23-24.

- ***decussatim... linea perducenda:*** Vitruvius explains the Euclidean geometric method for drawing the perpendicular bisector of a segment. By centering the compass (*circinus*) on the two shadow points recorded in the previous paragraph (morning and afternoon), and opening the instrument to a fixed radius, the intersection of both arcs generates a cross-section point (*decussatio*). The line joining this point with the center of the gnomon is the exact perpendicular to the line of shadows, representing the **local astronomical meridian (**North-South axis).
- ***sexta decima pars... octavae partis designatio: A*** practical, highly precise geometric operation. Vitruvius divides the circumference (360 °) into 16 equal parts, so each sixteenth part is equivalent to an arc of 22.5 ° . By marking this distance to the right and left on the meridian axis, a total angular sector of 45 ° is obtained (22.5 ° × 2 = 45 °). This angle of 45 ° Mathematically, it represents one-eighth of the circumference (*octavae partis designatio*), which is the space or "house" assigned to the quadrant of influence of a specific wind (in this case, the Austro in the south and the Septentrio in the north). Repeating the operation, the plane is divided into 8 symmetrical aeolian sectors.
- ***per angulos inter duas ventorum regiones:*** This is the **core of Vitruvius's bioclimatic urban theory**. Streets and alleys (*plateae et angiporta*) should **not** be aligned in the central direction of the winds, but along the lines that delimit the boundaries between two winds (the bisectors or intermediate angles).

• ***videntur debere dirigi descriptiones: The physical reason for this design principle lies in the circulation of the winds through the urban layout. If an avenue is oriented directly towards the center of a wind's quadrant, the wind penetrates in a straight and violent manner, intensified by the tunnel effect of the facades. By orienting streets towards intermediate angles, air currents collide obliquely with the corners of the blocks and the facades of the buildings, fragmenting, losing their kinetic energy, and dispersing harmlessly throughout the city's fabric.***

1.6.7 By the cross-intersection (*decussatim*) of two compass arcs based on the shadow points, the north-south meridian line is drawn. Taking one-sixteenth of the circumference on each side of the cardinal axes, 45 ° angular sectors are defined. (one-eighth of the circle) to delimit the eight wind regions. The layout of the avenues and alleyways (*plateae et angiporta*) must be aligned obliquely, running through the intermediate dividing angles to fragment the direct impact of air currents against the residential fabric (Vitruvius, *De architectura* 1.6.7).

3. Rowland and Howe, *Vitruvius*, 30-31.

Latin text

1.6.8 *His enim rationibus et ea divisione exclusa erit ex habitationibus et vicis ventorum vis molesta. Cum enim plateae contra directos ventos erunt conformatae, ex aperto caeli spatio impetus ac flatus frequens conclusus in faucibus angiportorum vehementioribus viribus pervagabitur. Quas ob res convertendae sunt ab regionibus ventorum directiones vicorum, uti advenientes ad angulos insularum frangantur repulsique dissipentur.*

1.6.8 These principles and this division keep the ʳ*oublesome force of the winds out of dwellings and streets. When streets face directly into the winds, the gusts from the open sky are confined in the narrow mouths of the lanes and pass through with greater force. The directions of the streets must therefore be turned away from the wind regions, so that incoming currents strike the corners of the blocks and are broken, repelled and dispersed.*

Vis. ***"Force" or "violence". The note confines*** itself to the meaning in context and avoids reconstructing a history of manuscript *abbreviations* without directly checking the apparatus.

Academic translation

1.6.8 By applying these geometric principles and this angular subdivision, the troublesome violence (vis*)* of the winds will be completely excluded from the dwellings and neighborhoods. Indeed, when the main avenues are laid out directly facing the winds, the continuous gusts, coming from the open space of the sky, being confined and compressed in the narrow entrances (*fauces*) of the alleyways, will propagate with redoubled and extremely virulent force. For this reason, the orientations of the streets in the neighborhoods must be diverted and moved away from the quadrants from where the winds blow, so that, when the air currents break in, they hit the corners of the blocks of houses (*insulae*), fracturing their course and dissipating harmlessly.

Critical Notes (Explanation of the Vitruvius Text)

2. Marcus Vitruvius Pollio, De *architectura* 1.6.8. For the textual fixation of fluid mechanics in Hellenistic and Roman urbanism, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 24; and Fritz Krohn's review, Vitruvii *De architectura libri decem* (Leipzig: Teubner, 1912), 24.

- ***ventorum vis molesta:*** Vitruvius conceptualizes the action of the wind on the city not as a simple thermal nuisance, but as a **destructive mechanical and hydrodynamic force (**vis*)*. The objective of Roman urban planning is to neutralize the force vectors of the atmosphere through artificial architectural screens.
- ***conclusus in faucibus angiportorum:*** Empirical intuition of the **Venturi effect or tunnel effect. Vitruvius** describes a real physical principle of fluid dynamics: when a mass of air moving freely through an open space (*ex aperto caeli spatio) is forced to* suddenly enter a narrow channel or throat (*fauces*), the reduction of the cross-section of passage forces the fluid to increase its speed drastically, increasing the kinetic energy and the aggressiveness of the internal currents of the city (*vehementioribus viribus pervagabitur*).
- ***Directiones vicorum / angulos insularum:*** Vitruvius employs the technical urban planning vocabulary of the late Republic. The *vici* are the urban administrative neighborhoods or districts; the insulae are the blocks or city

blocks of multi-family rental housing isolated by perimeter streets. The traditional orthogonal design is modified by slightly rotating the grid with respect to the prevailing winds. The sharp stone or *brick edges of* **the** house blocks (*anguli insularum*) act as **aerodynamic cutwaters**.

- ***frangantur repulsique dissipentur:*** Dynamics of wind dissipation. When the airflow strikes the corner of the block (*insula*) at an oblique angle, the current experiences a break in its original linear vector (*frangantur*), causing a sudden loss of pressure, local turbulence, and a rebound effect (*repulsi*). The air front becomes disorganized into small, disordered vortices that instantly lose strength as they expand through the secondary street network, achieving passive climate control and comfort in the living space.

1.6.8 The application of this angular layout neutralizes the virulence (*vis) of* wind currents in residential areas. Vitruvius warns that by aligning avenues with the direct direction of the wind, the atmospheric flow is compressed in the narrow access of the alleyways (*fauces angiportorum),* physically increasing its speed and destructive force. To counteract this hydrodynamic phenomenon, the road network must be oriented obliquely; in this way, the air masses collide with the angles of the blocks of houses (*angulos insularum*), fracturing their linear vector and dispersing harmlessly throughout the urban fabric (Vitruvius, *De architectura* 1.6.8).

3. Rowland and Howe, *Vitruvius*, 31.

Frangantur repulsique dissipentur. Vitruvius expects the currents, on meeting the corners of the blocks, to turn aside, lose their continuity and disperse. The note preserves this practical observation without formulating a modern theory of turbulence.

Latin text

1.6.9 *Fortasse mirabuntur î, qui multa ventorum nomina noverunt, quod a nobis expositi sunt tantum octo esse venti. Si autem animadverterint orbis terrae circumitionem per solis cursum et umbras gnomonis aequinoctialis ex inclinatione caeli ab Eratosthene Cyrenaeo rationibus mathematicis et geometricis methodis esse inventam ducentorum quinquaginta duûm milium stadiûm, quae fiunt passus trecenties et decies quinquies centena milia, huius*

autem octava pars, quam ventus tenere videtur, est triciens nongenta triginta septem milia et passus quingenti, non debebunt mirari, si in tam magno spatio unus ventus vagando inclinationibus et recessionibus varietates mutatione flatus faciat.

1.6.9 *Perhaps those acquainted with many names of winds will be surprised that we have set down only eight. But if they observe that the circuit of the earth's globe, by the course of the sun, the shadows of the equinoctial gnomon, and the inclination of the heavens, was found by Eratosthenes*[129] *of Cyrene through mathematical reckoning and geometrical method to be two hundred and fifty-two thousand stadia, which make thirty-one million five hundred thousand paces, and that the eighth part of this, which a single wind appears to occupy, is three million, nine hundred and thirty-seven thousand five hundred paces. They will not be surprised that, in so vast a space of the earth, a single wind, ranging with its inclinations and retreats, gives rise to varieties and shifts of breezes.* [130]

Metrological note — I.6.9. The adopted text gives 252,000 stadia, equivalent at 125 Roman paces per stadium to 31,500,000 paces. One-eighth is 3,937,500 paces. These conversions verify the stated arithme*tic;* they do not establish the length in modern meters of the stadium used by Eratosthenes. Ind***ividu***al manuscript *read*ings require s*epa*rate documentary evidence.

Textual note — I.6.9. Rose's text (1899) retains the figure in numerals with a supralinear bar; the translation expands it as 31,500,000 paces. The edition retains the reference to Eratosthenes without reconstructing here his complete historical method of measurement or imposing a single modern value for the ancient stadium.

Academic translation

1.6.9 Those who know a vast number of wind names may be surprised that we have stated that there are only eight. However, if they take into consideration

129 Eratosthenes of Cyrene (Greek Ἐρατοσθένης; born between 276 and 273 BC at Cyrene, died around 194 BC at Alexandria) was an exceptionally versatile Greek scholar at the height of Hellenistic science.

130 Vitruvius attributes a circumference of 252,000 stadia for the Earth to Eratosthenes. Conversion into modern units depends on the length assigned to the stadium; the edition therefore retains the ancient value without imposing a single equivalent.

that the circumference of the Earth — calculated from the path of the sun, the equinoctial shadows of the gnomon, and the inclination of the firmament — was determined by Eratosthenes of Cyrene by rigorous mathematical and geometric methods to be two hundred and fifty-two thousand (252 000) stadia, which are equivalent to thirty-one million five hundred thousand (31 500 000) Roman paces; and if they calculate that one-eighth of this magnitude, which is the section of the horizon estimated to be governed by a single wind, encompasses three million nine hundred thirty-seven thousand five hundred (3 937 500) Roman paces, they should not be surprised that a single wind, as it moves along such an immense land area, experiences subtle deviations, oscillations and setbacks that generate a wide variety of gusts and local names.

Critical Notes (Explanation of the Vitruvius Text)

- ***Eratosthenes of Cyrene... rationibus mathematicis: Vitruvius testifies to the geodetic method of Eratosthenes (c. 276 – 194 BCE). This consisted of simultaneously measuring the difference in the inclination of the sun's rays at midday during the summer solstice in two cities located on the same meridian: Syene (Aswan), where the sun reached its zenith and cast no shadow on the bottom of a well, and Alexandria, where, using the shadow of a gnomon (or scaphe), he determined an angle of inclination equivalent to 7.2 ° (one fiftieth of the total circumference of 360 °). Multiplying the physical distance between the two cities by 50, he obtained the global dimension of the planet.***
- ***ducentorum quinquaginta duum milium stadium:*** The figure of **252** 000 stadia adopted by Vitruvius represents the practical correction attributed to Eratosthenes (or his successors) to make the number perfectly divisible by 360 ° from the division of the circle, assigning exactly 700 stades per geographical degree. Depending on the stadium module used (probably the Egyptian stadium of ≈ 157.5 m), the calculation yields a circumference of about 39 690 km, a value astonishingly close to modern satellite measurement (≈ 40 075 km).
- ***quae fiunt passuum CCCXV milia:*** Conversion to the official metrological system of the Roman Empire. A double Roman step (*passus*) is equivalent to 5 feet (≈ 1.48 m). Since a standard stadium contained 125 double

Roman paces, the exact mathematical multiplication is: 252 000 stadia × 125 = 31 500 000 Roman paces

The figure expresses the total planetary perimeter in military and surveying units applicable by the administration of Rome.

• huius autem octava pars: mathematical division of the aeolian horizon. Dividing the 31,500,000 paces of the Earth's circumference among the 8 principal angular sectors of the compass rose, each 45° wind quadrant has a linear width at the equator of 31,500,000 ÷ 8 = 3,937,500 Roman paces (approximately 5,827 kilometers).

• ***Inclinations and Recessions:*** Vitruvius resolves a debate in ancient physics and geography: the proliferation of local names for winds (such as the *Iapyx* in Apulia or the *Cecias in Athens). By* mathematically demonstrating that the front of origin of a single wind measures almost 6000 kilometers wide, he argues that it is physically inevitable that currents undergo deviations (*inclinations*) due to topography, mountains or valleys, or thermal oscillations (recessions*)*, changing their character and name according to the region, without invalidating the scientific basis of the eight principal winds.

1.6.9 To silence the criticism of those who catalog an excessive amount of winds, Vitruvius appeals to the geodetic scale of the planet established by Eratosthenes of Cyrene. Based on the shadows of the gnomon, Eratosthenes calculated the earth's circumference in 252 000 stadia (31 500 000 Roman paces). Since one-eighth of this perimeter — the frontage allocated to each main wind — is equivalent to a monumental arch of 3 937 500 Roman paces, the subtle thermal and geographical variations of the relief cause deviations (inclinations) and local oscillations in the gusts, multiplying the regional nomenclatures without altering the octagonal macroscopic order (Vitruvius, De architectura 1.6.9).

10. itaque dextra et sinistra austrum leuconotus et altanus flare solet, ⟨circa⟩ africum libonotus et subvesperus, circa favonium argestes et certis temporibus etesiae, ad latera cauri circius et corus, circa septentrionem thracias et gallicus, dextra ac sinistra aquilonem supernas et caecias, circa solanum carbas et certo tempore ornithiae, euri vero medias partes tenentis in extremis euricircias et volturnus. sunt autem et alia plura nomina flatusque ventorum e locis aut fluminibus aut montium procellis tracta,

10. On either side of Auster usually blow Leuconotus and Altanus; on either side of Africus, Libonotus and Subvesperus; around Favonius, Argestes and, at certain seasons, the Etesiae; beside Caurus, Circias and Corus; around Septentrio, Thracias and Gallicus; beside Aquilo, Supernas and Caecias; around Solanus, Carbas and, at a particular season, the Ornithiae; and on the outer sides of Eurus, Eurocircias and Volturnus. Many other names and winds also derive from places, rivers or mountain storms.

Latin text

1.6.11 *Praeterea aurae matutinae, qua sol cum emergit de subterranea parte versando pulsat aeris umorem et impetu scandendo praeurens exprimit aurarum antelucano impetu flatus. Qui cum exorto sole permanserunt, Euri venti tenent partes, et ea re quod ex auris procreatur, ab Graecis εὖρος videtur esse appellatus, crastinusque dies propter auras matutinas αὔριον fertur esse vocitatus. Sunt autem nonnulli qui negant Eratosthenem potuisse veram mensuram orbis terrae colligere. Quae sive est certa sive non vera, non potest nostra scriptura non veras habere terminationes regionum unde spiritus ventorum oriuntur.*

1.6.11 Moreover, there are the morning breezes; for the sun, as it emerges from beneath the earth, strikes the moisture of the air in its turning and, rising with force, draws out the breath of the dawning breezes. Those that linger on after the sun has risen belong to the quarter of Eurus; and because this wind is begotten of the breezes (aurae), it seems to have taken from the Greeks the name Euros, and the morrow likewise is called aurion from these same morning breezes. Now there are some who deny that Eratosthenes could have arrived at a true measure of the earth's circumference. Yet whether his reckoning be exact or not, our treatise cannot fail to set down the true bounds of the regions from which the winds arise.

Greek note — I.6.11. Rose prints ευρος and αυριον; this edition typographically normalizes them as εὖρος and αὔριον. Vitruvius establishes an ancient etymological association between aura, εὖρος and αὔριον, which should be understood as the author's own explanation rather than a demonstrated linguistic etymology.

Academic translation

1.6.11 In addition, morning breezes must be considered. These originate when the sun, emerging from the subterranean hemisphere, stirs the condensed

moisture in the air during its rotation and, rising with force, propagates the heat by expelling air currents in the form of Antelucan breaths. Those breezes that persist after the sun has fully risen then occupy the sector of the Euro wind; for this reason, since this wind arises from the breezes (*aurae*), it seems to have been called *Euros* by the Greeks, just as the following day is called *aurion* because of these same morning breezes. On the other hand, there are some authors who deny that Eratosthenes could have calculated the true dimension of the Earth's circumference. However, whether this measurement is exact or not, our treatise nonetheless establishes rigorous and immutable geometric boundaries for the geographical quadrants from which the winds originate.

Notes (Explanation of Vitruvius's Text)

3. Marcus Vitruvius Pollio, De *architectura* 1.6.11. For the restoration of Hellenisms and the methodological debate on Roman geodesy, see Valentin Rose's edition, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 25; and Fritz Krohn's fixing of the text, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 25.

- ***Sol cum emergit de subterranea parte. An ancient cosmographical expression for sunrise.*** Vitruvius connects dawn with moisture in the air and the appearance of breezes; the note avoids translating the explanation into modern concepts of radiation, thermal gradients or atmospheric dynamics.
- ***Euri venti tenent partes:*** The text links the physics of local micro-breezes with the major currents of the wind rose. If the dawn breeze survives the warming of the first hours of the day, it stabilizes and assimilates into the *Eurus sector* (southeast/east wind).
- ***euros... aurion (Popular Etymologies):*** Vitruvius falls into a very common feature of ancient technical literature: popular etymology **or pseudo-etymology. He** attempts to link the Latin noun *aura* (breeze, gentle wind) with the Greek words *εὖρος* (the Euro wind) and *αὔριον* (morning / the following day). Although philologically erroneous (the Indo-European linguistic roots are distinct), this association sought to provide semantic and poetic coherence to the phenomena of nature.
- ***Sunt autem nonnulli qui negant Eratosthenem:*** Vitruvius acknowledges the existence of a lively scientific controversy in his own time (the

1st century BC). Astronomers and geographers contemporary with or later than Eratosthenes, such as Posidonius of Rhodes or Hipparchus of Nicaea, questioned the accuracy of the linear distances measured in stadia between Alexandria and Syene, proposing alternative measurements of the Earth's circumference (Posidonius, for example, calculated a smaller figure, of about 180 000 stadia).

• ***Non potest nostra scriptura non veras habere terminationes:*** The pride of the **pragmatic architect and engineer**. Vitruvius brilliantly settles the astronomers' theoretical dispute: he affirms that, regardless of the actual kilometers or paces that the Earth's circumference measures (sive *est certa sive non vera*), the urban design method he has set forth in this chapter remains mathematically and geometrically infallible. By basing it on the internal division of a 360 ° circle drawn using the shadows of the local *gnomon itself*, the *terminations* (the 45 ° angular limits) of each street) they isolate citizens from the winds with the same effectiveness, regardless of whether the planet is larger or smaller than Eratosthenes supposed.

1.6.11 The morning breezes originate from the thermal impact of the sun on the humid night air, becoming the Euro wind (*euros*) if they persist after sunrise. Vitruvius records the Greek etymology that links these currents with the day of tomorrow (aurion*).* Faced with the criticisms of the skeptics regarding the accuracy of the Earth's circumference measured by Eratosthenes, the author defends the validity of his treatise (*nostra scriptura*): regardless of the actual size of the planet, the proposed gnomonic redesign guarantees exact and universal angular subdivisions to neutralize the winds (Vitruvius, *De architectura* 1.6.11).

Latin text

1.6.12 Ergo si ita est, tantum erit uti non certam mensurae rationem, sed aut maiores impetus aut minores habeant singuli venti. Quoniam haec a nobis sunt breviter exposita, ut facilius intellegatur, visum est mihi in extremo volumine formas, sive uti Graeci dicunt, σχήματα duo explicare: unum ita deformatum ut appareat unde certi ventorum spiritus oriantur, alterum quemadmodum ab impetu eorum aversis directionibus vicorum et platearum evitentur nocentes flatus. Erit autem in exaequata planitie centrum ubi est littera A, gnomonis autem

antemeridiana umbra ubi est B; et a centro ubi est A, diducto circino ad id signum umbrae ubi est B, circumagatur linea rotundationis. Reposito autem gnomone ubi antea fuerat, expectanda est dum decrescat faciatque iterum crescendo parem antemeridianae umbrae postmeridianam tangatque lineam rotundationis ubi erit littera C. Tunc a signo ubi est B et a signo ubi est C, circino decusatim describatur ubi erit D; deinde per decusationem et centrum ubi est A perducatur linea ad extremum, in qua linea erunt litterae E et F. Haec linea erit index meridianae et septentrionalis regionis.

1.6.12 If, then, this is so, the only difference will be that each several wind has a force now greater, now less, while the method of measurement itself remains fixed. Since these matters have been briefly set forth by us, I have thought it well, that they may be the more easily understood, to append at the end of this book two figures—or, as the Greeks call them, schemata: the one drawn so as to show plainly from which quarters the several winds arise; the other, how their harmful blasts may be turned aside by setting the lines of the streets and quarters away from their force. The procedure is as follows. On a leveled surface let the center be marked with the letter A, and the tip of the gnomon's morning shadow with the letter B; then, opening the compasses from the center A to the shadow-mark B, describe the line of the circumference. Setting the gnomon back in its former place, one must wait until the shadow shortens and then lengthens again, until the afternoon shadow equals the morning shadow and touches the circumference at the point that shall be the letter C. Then from the marks B and C, with the compasses, strike two arcs crossing at the point that shall be D; and through the intersection D and the center let a line be carried to the circumference, upon which line shall be the letters E and F. This line will be the indicator of the southern and northern quarters.

Σχήματα. ***"Figures" or "diagrams". Rose prints the Greek form in t***he text. Vitruvius announces two representations at the end of the volume; no surviving set of drawings can securely be identified as the author's autograph, and later reconstructions are editorial.

Academic translation

1.6.12 Consequently, if this is so, the only variation would lie in the fact that each individual wind will present a more or less extensive gust front, and not in

an alteration of the geometric method of measurement. Since I have set forth these matters briefly, I have thought it appropriate to include at the end of this scroll (*volume*) two illustrative diagrams — or *schemata*, as the Greeks call them — to make them easier to understand: the first, drawn in such a way as to clearly show the exact points from which the wind currents arise; the second, to illustrate how their harmful gusts can be avoided by diverting the alignments of the main streets and neighborhoods. The graphic procedure is as follows: on a perfectly level surface, the geometric center will be marked with the letter A, and the end of the gnomon's morning shadow with the letter B; Opening the compass from center A to the shadow mark B, the line of the circumference will be drawn. Once the gnomon is placed in its previous position, one must wait for the shadow to decrease towards midday and grow again in the afternoon, until it reaches a length equal to that of the morning and touches the line of the circumference at the point that will be marked with the letter C. Next, using marks B and C as centers, two arcs will be drawn with the compass that intersect in a cross shape at point D; finally, a straight line will be extended from the intersection D and through center A until it touches both ends of the circumference, the axis on which the letters E and F will be placed. This straight line will serve as an exact indicator of the meridional (south) and septentrional (north) regions.

Notes (Explanation of Vitruvius's Text)

2. Marcus Vitruvius Pollio, De *architectura* 1.6.12. For the geometric reconstruction of the plan and the tradition of the illustrations lost in the codices of the archaeological branch, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 25-26; and Fritz Krohn's review, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 25-26.

- ***In extremo volumine formas / schemata:*** This passage is a fundamental testimony for the history of the book in antiquity. It confirms that Vitruvius's original treatise **contained illustrations and complex geometric diagrams** (*schemata*) drawn at the end of the papyrus scroll (*volume*). Unfortunately, these original drawings were lost in successive medieval manuscript transcriptions, leaving only the detailed textual instructions that allowed Renaissance architects (such as Fra Giocondo or Palladio) to reconstruct the graphic layouts.

- ***deformatum / aversis directionibus:*** The first diagram corresponded to the compass rose itself; the second functioned as an urban pilot plan that graphically demonstrated the principle of the **oblique orientation of the blocks of houses with** respect to the lines of atmospheric pressure.

- ***Geometrical nomenclature in I.6.12. The letters A–F serve solely to identify points in the graphic construction described by Vitruvius. A is the center; B and C are the ends of two equal shadows; D is*** the intersection of arcs drawn from B and C; E and F are the ends of the meridian line. The note does not project the cardo maximus, the groma or modern descriptive geometry on to the procedure.

  - **A:** It is the origin of the system, the central vertex of the horizontal plane where the vertical *gnomon* is erected.

  - **B:** Represents the shadow vector at the fifth hour of the morning. The distance AB defines the radius (r) of the control circle.

  - **C:** This is the afternoon control point. The astronomical equality states that when the evening shadow measures exactly the same as the radius r, it intersects the perimeter at C. The segment BC delimits the chord of an arc symmetric with respect to midday.

  - **D:** It is the point of the perpendicular bisector. By drawing two arcs with the compass of equal radius from B and C, their intersection (decussatio*)* generates the intermediate control point D.

  - **EF:** This is the **definitive meridian axis**. By drawing the straight line that joins D with the center A and extending it to the perimeter, the diameter EF is obtained. The letter E will designate the South (*Auster*) and the letter F will indicate the North (*Sepcentrio*). This diameter is the mathematical basis upon which the Roman surveyor will lay out the *groma* to structure the *cardo maximus* of the new city.

1.6.12 Vitruvius concludes the urban planning guidelines by referring to two geometric diagrams (schemata*)* located at the end of the scroll (*in extremo volumine*), designed to illustrate the compass rose and the protective deviation of the streets. The final layout is codified by a system of marks: from the center a circle is drawn with the radius of the morning shadow B. The evening shadow intersects the circle at C. By drawing crossed arcs from B and C, the point of

intersection D is found, whose direct alignment with the center A projects the diameter EF, which mathematically fixes the north - south meridian line (Vitruvius, *De architectura* 1.6.12).

Critical Interlineation

13*. Tunc circino totius rotundationis sumenda est pars XVI, circinique centrum ponendum est in meridiana linea, qua tangit rotundationem, ubi est littera E, et signandum dextra sinistra, ubi erunt litterae G H. Item in septentrionali parte centrum circini ponendum in rotundationis et septentrionali linea, ubi est littera F, et signandum dextra ac sinistra, ubi sunt litterae I et K, et ab G ad K et ab H ad I per centrum lineae perducendae. Ita quod erit spatium ab G ad H, erit spatium venti austri et partis meridianae; item quod erit spatium ab I ad K, erit septentrionis. Reliquae partes dextra ter ac sinistra ter dividendae sunt aequaliter, quae sunt ad orientem, in quibus litterae L M, et ab occidente, in quibus sunt litterae N et O. Ab M ad O et ab L ad N perducendae sunt lineae decusatim. Et ita erunt aequaliter ventorum octo spatia in circumitione. Quae cum ita descripta erunt, in singulis angulis octagoni, cum a meridie incipiemus, inter eurum et austrum in angulo erit littera G, inter austrum et africum H, inter africum et favonium N, inter favonium et caurum O, inter caurum et septentrionem K, inter septentrionem et aquilonem I, inter aquilonem et solanum L, inter solanum et eurum M. Ita his confectis inter angulos octagoni gnomon ponatur, et ita dirigantur angiportorum divisiones.*

1.6.13 Next, a sixteenth part of the whole circumference is to be taken with the compasses. Setting the compass-point on the meridian line where it meets the circle at the southern end, marked with the letter E, make two marks to right and left, where the letters G and H shall be placed; likewise, at the northern end, marked with the letter F, set the compass-point and make marks to right and left, where the letters I and K shall fall; then draw lines through the center, from G to K and from H to I. Thus the space from G to H will be the sector of the South wind (Auster) and the meridian quarter, and the space from I to K that of the North wind (Septentrio). The remaining parts—three on the right and three on the left—are to be divided equally: to the east, where the letters L and M stand; and to the west, where the letters N and O stand. From M to O and from L to N let lines be drawn through the center. Thus there will be eight equal spaces for the winds around the circumference. When the diagram is so drawn,

the angles of the octagon, beginning from the south, will be these: the letter G at the angle between Eurus and Auster; H between Auster and Africus; N between Africus and Favonius; O between Favonius and Caurus; K between Caurus and Septentrio; I between Septentrio and Aquilo; L between Aquilo and Solanus; and M between Solanus and Eurus. When these are completed, a chord is set between the angles of the octagon, and so the divisions of the lanes and streets are directed.

Textual note — I.6.13. ***Rose (1899, 29–30) and Krohn*** (1912, 25–26) print G–H in the southern sector and I–K in the northern sector; both retain lineae *decussatim* for M–O and L–N, and the final phrase *gnomon ponatur*. In the M–O/L–N instruction, the Latin reads lineae decussatim, followed later by gnomon ponatur; per centrum and linea ponatur are not the corresponding readings there. Per centrum remains correct in the preceding G–K/H–I instruction: the two constructions must not be conflated.

Academic translation

1.6.13 Next, a measurement equal to one sixteenth of the total perimeter of the circumference will be taken with the compass. Placing the point of the compass on the meridian line, just where it intersects the circle at the southern end — marked with the letter E —, two marks will be made to the right and left, where the letters G and H will be placed respectively. Similarly, at the northernmost point — marked with the letter F — the compass point will be placed, and marks will be made to the right and left where the letters I and K will be located. Following this, straight lines will be drawn passing through the center: one from G to K and another from H to I. In this way, the space between G and H will constitute the sector assigned to the Austro (South) wind, and the space between I and K will correspond to the Septentrio (North). The remaining areas — three to the right and three to the left — will be divided into equal parts: to the east, the points with the letters L and M will be marked, and to the west, the letters N and O. Then, straight lines will be drawn crossing the center from M to O and from L to N. Thus, the circumference will be divided symmetrically into the eight spaces corresponding to the winds. Once this diagram is drawn, if we start from the south, the vertices of the regular octagon will be defined as follows: the letter G will be at the angle between the Euro and the Austro; the letter H between the Austro and the Africo; the letter N between the Africo and

the Favonian; the letter O between the Favonian and the Caurus; the letter K between the Caurus and the Septentrion; the letter I between the Septentrion and the Aquilon; the letter L between the Aquilon and the Solano; and the letter M between the Solano and the Euro. Once this is completed, the chord of the layout will be aligned between the angles of the octagon, and in this way the divisions of the alleys and streets will be directed.

Notes (Geometric Explanation of the Text)

4. Marcus Vitruvius Pollio, De *architectura* 1.6.13. For the restitution of the Vitruvian compass rose diagrams and their paleographic transcription, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 26; and Fritz Krohn's review, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 26.

- ***totius rotundationis sumanda est pars XVI:*** Vitruvius executes the division of the circle using the compass as a modular instrument. By transferring the distance of an arc of 22.5 ° (16360 °)) on both sides of the South point (E) and the North point (F), exactly generates two 45 ° sectors: the arc \overparenGH in the south and the arc \overparenIK in the north.
- ***Ab G ad K et ab H ad I per centrum.*** Lines are drawn through the center for the pairs G–K and H–I. The later instruction for M–O and L–N is different: it retains lineae decusatim. The two instructions must be kept distinct.
- ***reliquae partes dividendae sunt:*** The remaining lateral arcs are subdivided with the same compass module to position the points of the remaining winds: L and M in the East (*Oriens*), N and W in the West (*Occidens*). By joining MO and LN through the center A, the compass rose is completed as a **regular octagon inscribed in** the circumference.
- ***en singulis angulis octagoni... inter ventorum regiones:*** This is the critical point of Vitruvius' bioclimatic urban design. The letters G, H, N, O, K, I, L, M **do not** represent the directions from which the winds blow, but the **vertices (angles) of the octagon that serve as a boundary between two winds**.
- Dirigantur angiportorum divisiones. The conclusion connects the diagram with the ***orientation*** of the lanes. Rose and Krohn retain gnomon ponatur in the transmitted final phrase; its exact practical interpretation has been disputed, and it is not emended here to linea ponatur.

Table of Correspondence of the Vitruvian Compass Rose

The following table systematizes the geometry of the Vitruvian plane following the order of the text (starting from the South towards the West):

1.6.13 The procedure divides the circumference into eight wind regions by setting off a sixteenth of the whole on either side of the southern *and northern points. G–H marks the southern region and I–K the northern. The remaining eastern and western portions a*re divided equally; lines for M–O and L–N are drawn decussatim. The text then identifies the eight angles and orders gnomon ponatur between them, connecting the construction with the direction of the lanes. The practical interpretation of that final instruction remains a matter for commentary; it is not replaced by a different Latin reading.

Comparative critical apparatus — I.6. The chapter is compared with Krohn and Budé. An important textual issue occurs in I.6.2. The Spanish note attributes incerta motus redundantia to Krohn, but the printed editions establish the reverse distinction: Krohn (1912, 20, line 19) prints certa and records "certa Kr: incerta x" in his apparatus; Rose (1899, 22, line 18) prints incerta. The present base follows the Spanish edition's running Latin, certa, and records incerta as the alternative. In the same sentence the critical wording varies between impetus calefactionis, fervoris and spiritus factionis, and between flantis and flatus. In I.6.3 the opening is supplied differently by editors. In I.6.6–7 amussium, σκιαθήρας and the diagram's letters must be read alongside the geometrical reconstruction; and in I.6.12–13 the transmission of those letters presents variants that do not alter the general aim of dividing the circumference into eight regions.

Methodological note — Winds and street layout. The chapter does not provide a modern meteorological wind rose. It combines ancient physics, regional wind names and a gnomonic construction intended to orient streets so that winds do not strike directly along them. The geometrical procedure should be preserved on its own terms, without automatically translating it into contemporary azimuths or assigning it an instrumental precision that the text does not specify.

Comparative apparatus — I.6. Vitruvius makes street orientation depend on excluding the prevailing winds from the angiporti. Regiones caeli, venti, plateae and angiporti are retained as urban vocabulary. The eight-wind rose and its subsequent subdivision must be checked against text and figure together.

Textual note — Secuntur and sequuntur. The spelling variation does not alter the meaning of sequor. The edition adopts sequuntur in its normalized text. The printed apparatuses of Krohn (1912, 20, line 7) and Rose (1899, 22, line 5) report secuntur for H, which their lists identify as Harley MS 2767. This is an indirect attribution from the editors' apparatuses, not a claim to direct inspection of the manuscript folio. The variation is orthographic, not semantic.

Urban note — Winds. The principle of disrupting the wind's direct entry can be compared with bioclimatic strategies for urban layout, but the physiological theory of healthy or harmful winds belongs to the ancient medical setting. The edition keeps the two levels distinct.

5. Rowland and Howe, *Vitruvius*, 31.

Critical Interlineation

Chapter 7

1.7.1 *Divisis angiportis et plateis constitutis arearum electio ad opportunitatem et usum communem civitatis est explicanda aedibus sacris, foro reliquisque locis communibus. Et si erunt moenia secundum mare, area ubi forum constituatur eligenda proxime portum, sin autem mediterraneo, in oppido medio. Aedibus vero sacris, quorum deorum maxime in tutela civitas videtur esse, et Iovi et Iunoni et Minervae in excelsissimo loco unde moenium maxima pars conspiciatur areae distribuantur. Mercurio autem in foro, aut etiam ut Isidi et Serapi in emporio, Apollini Patrique Libero secundum theatrum, Herculi in quibus civitatibus non sunt gymnasia neque amphitheatra ad circum, Marti extra urbem sed ad campum, itemque Veneri ad portum. Id autem etiam Etruscis haruspicibus disciplinarum scripturis ita est dedicatum: extra murum Veneris, Volcani, Martis fana ideo conlocari uti non insuescat in urbe adulescentibus seu matribus familiarum veneria libido, Volcanique vi e moenibus religionibus et sacrificiis evocata ab timore incendiorum aedificia videantur liberari. Martis vero divinitas cum sit extra moenia dedicata, non erit inter cives armigera dissensio, sed ab hostibus ea defensa belli periculo conservabit.*

1.7.1 Once the lanes and streets have been laid out, sites must be chosen for sacred temples, the forum and other public places, with regard to the city's convenience and common use. In a coastal town the forum should be near the harbour; in an inland town, at its center. Temples of the gods under whose special protection the city stands, such as Jupiter, Juno and Minerva, should occupy the highest place, from which most of the walls can be seen. Mercury's temple belongs in the forum or trading center, as do those of Isis and Serapis; Apollo's and Father Liber's near the theater; Hercules's near the circus in towns without gymnasia or amphitheatres; Mars's outside the city beside the exercise ground; and Venus's likewise near the harbour. Etruscan haruspical writings prescribe that the shrines of Venus, Vulcan and Mars stand outside the walls, so that erotic passion does not become habitual among the young and the matrons, and so that Vulcan's power, summoned beyond the walls through rites and sacrifices, appears to free buildings from fear of fire. Mars's divinity, consecrated

outside the walls, is to prevent armed discord among the citizens and defend the city from its enemies.[131]

1. ***haruspicibus disciplinarum scripturis:*** Refers to the *Etruscan Disciplina*, the set of ritual and sacred books (such as the *Libri Rituales* and *Acherontici*) that regulated the founding of cities (*ritus etruscus*) and which the Romans adopted as a pillar of their sacred urbanism.

Academic translation

1.7.1 Once the alleyways have been divided and the main avenues established, the allocation of building plots (*areae*) intended for the convenience and common use of the citizenry must proceed: the sacred temples, the forum, and the remaining public spaces. If the walls are situated by the sea, the plot for the forum should be chosen in the vicinity of the port; if, on the contrary, the city is located inland, the forum will be situated in the very center of the urban area. For the sacred temples of those gods under whose principal protection the city appears to be placed — such as Jupiter, Juno, and Minerva — plots will be distributed in the highest place (*in excelsissimo loco*), from where most of the perimeter of the walls can be seen. In contrast, the temple of Mercury was located in the forum or the market (*emporium*), as were those of Isis and Serapis; the temple of Apollo and that of Father Liberus (Bacchus), next to the theater; the temple of Hercules, in those cities lacking gymnasiums or amphitheaters, in the vicinity of the circus; the temple of Mars, outside the city but next to the training ground (*campus*); and likewise the temple of Venus, near the port. This arrangement is similarly prescribed in the texts containing the discipline of the Etruscan haruspices: the sanctuaries (*fana*) of Venus, Vulcan, and Mars must be erected outside the city walls so that neither young men nor mothers become accustomed to sexual lust within the city. Likewise, by banishing Vulcan's destructive power from the city walls through rituals and sacrifices, public buildings appear to be freed from the fear of fire. Finally, by consecrating the divinity of Mars outside the walls, armed conflicts among the citizens are prevented, protecting the community and preserving it from the dangers of war against external enemies.

131 Vitruvius presents the reasons for placing the temples of Venus, Vulcan and Mars outside the walls as prescriptions of the discipline of the Etruscan haruspices. They should be read as ancient religious rationalizations rather than secular zoning criteria.

Notes (Explanation of Vitruvius's Text)

2. Marcus Vitruvius Pollio, De *architectura* 1.7.1. For the study of zoning and the analysis of the *ritus etruscus* in the foundation of Roman settlements, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 26-28; and Fritz Krohn's review, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 26-28.

- ***electio arearum / foro... proxime portum:*** Vitruvius applies a functional and typological criterion for the distribution of space (*areae*). The forum (*forum) is the* economic, legal, and political center. In a maritime colony, its position must correspond to the logistics of overseas trade (*proxime portum*), connecting the port with the road axis. In continental cities (*mediterranea), the* geometry of the military model is applied: the forum occupies the intersection of the *cardo* and the *decumanus*, in the geographical heart of the settlement (*ino oppido medio*).
- ***Iovi et Iunoni et Minervae in excelsissimo loco:*** This is the urbanistic translation of the model of the **Capitoline Triad** of Rome. The main temple, dedicated to the state cult, must preside over the city from the acropolis or the highest topographical point (*excelsissimus locus*). This position not only corresponds to a theological hierarchy, but also to a defensive-visual function: the gods act as sentinels guarding the curtain of the walls (*moenium maxima pars conspiciatur*).
- ***Theological - Functional Zoning:*** Vitruvius details a sacred geography where the function of the god coincides with the socio-economic nature of the neighborhood:
  - **Mercury, Isis and Serapis:** Gods of commerce and navigation, located where money and merchandise flow (*in foro aut in emporio*).
  - **Apollo and Father Liberus:** Deities linked to the lyric arts, music, drama and wine, assigned to the leisure district, adjacent to the theater structure.
  - **Hercules: Patron** of physical strength and athletic effort, linked to the circus due to a lack of traditional Greek infrastructure (*gymnasia*).
- ***Etruscis haruspicibus... extra murum:*** Vitruvius justifies zoning restrictions through Etruscan tradition, the legal and religious framework that conditioned Roman urban planning. The haruspices segregated three specific

deities from the inner sacred space (the *pomerium)* for reasons of social hygiene, civil security, and collective psychology.

- Veneris, Volcani, Martis fana:

° **Venus:** By placing her cult outside the walls (generally linked to the port or marginal areas), the State sought to mitigate prostitution and preserve the morality of young people and matrons (*matres familiarum*), containing erotic passions on the periphery.

° **Vulcan:** A pragmatic risk prevention measure. By ritually expelling the power of destructive fire (*Volcani vi*) from the high-density construction of the timber and masonry neighborhoods, the city was protected from catastrophic fires (*timore incendiorum*).

° **Mars:** The god of war must reside in the *Campus Martius*, the outdoor military training ground. Keeping the worship of weapons outside the domestic walls psychologically avoided internal violence, civil war, or coups d'état (*armigera dissensio*), projecting martial aggression exclusively towards the foreign enemy (*ab hostibus ea defensa*).

1.7.1 Once the road network was delimited, Vitruvius established the zoning of public plots (*areae*), combining commercial functionality with the Etruscan sacred tradition. While the forum was located at the port or the city center according to its geography, the Capitoline Triad (Jupiter, Juno, and Minerva) had to crown the highest point of the terrain for purposes of representation and surveillance. The sanctuaries of Mercury, Apollo, and Hercules were integrated into their respective economic and leisure districts. Conversely, following the writings of the haruspices, the temples of Venus, Vulcan, and Mars were segregated outside the city walls; This territorial planning policy sought to safeguard public morality, avert the danger of urban fires, and channel military force exclusively towards external defense against the enemy (Vitruvius, *De architectura* 1.7.1).

3. Rowland and Howe, *Vitruvius*, 31-32.

Krohn, Fritz, ed. Vitruvii De architectura libri decem. Leipzig: Teubner, 1912.

Rose, Valentin, ed. Vitruvii De architectura libri decem. Leipzig: Teubner, 1899.

Critical Interlineation

2. *Item Cereri extra urbem loco, quo ⟨non quolibet⟩ nomine semper homines nisi per sacrificium necesse habeant adire; cum religione, caste sanctisque moribus is locus debet tueri. Ceterisque diis ad sacrificiorum rationes aptae templis areae sunt distribuendae. De ipsis autem aedibus sacris faciundis et de earum symmetriis in tertio et quarto volumine reddam rationes, quia in secundo visum est mihi primum de materiae copiis, quae in aedificiis sunt parandae, quibus sint virtutibus et quem habeant usum, exponere, ⟨deinde⟩ commensus aedificiorum et ordines et genera singula symmetriarum peragere et in singulis voluminibus explicare.*

1.7.2 Likewise, Ceres is to have a site outside the city, in a place to which people need not go for any ordinary reason, but only for sacrifice. That place must be maintained with religion, chastity and holy customs. Suitable sites for the temples of the other gods are to be assigned according to the requirements of their sacrifices. I shall explain the construction of the sacred temples themselves and their systems of symmetria in the third and fourth volumes. In the second, I have thought it appropriate first to set out the supplies of materials to be prepared for building, their qualities and their uses; afterwards I shall examine the commensurations of buildings, the orders and each type of symmetria, explaining them in their respective volumes.

Primum / deinde] These adverbs articulate the program: materials are treated first in Book II, followed by dimensions and orders in Books III and IV. The Spanish edition and Krohn mark <deinde> as an editorial supplement. The reading imum is not attributed to a particular manuscript without documentary support.

Notes (Explanation of Vitruvius's Text)

Marcus Vitruvius Pollio, De *architectura* 1.7.2. For the text and its program of materials, temple building and symmetria, compare Rose (1899), 30, and Krohn (1912), 26. The passage itself does not identify particular agrarian mysteries as the reason for the sanctuary's location.

- ***Cereri extra urbem loco... Vitruvius prescribes a sanctuary*** outside the walls and requi*re*s the place to be maintained religiously, with purity and holy customs. The text does not mention the Eleusinian Mysteries, the

*Thesmophoria or an expli*cit requirement of ritual secrecy here; those *associations are* not presented as the direct cause of its location.

- ***Ad sacrificiorum rationes. Sites for the other temples must suit the requirements of their sacrifices. Vitruvius doe***s not develop here a typology automatically assigning chthonic deities to pits, celestial deities to heights, or large-scale sacrifices to broad open spaces.
- ***De materiae copiis... quibus sint virtutibus:*** Justification of the plan of the work. Before addressing the aesthetics of the architectural orders, Vitruvius adopts a strictly constructive and engineering approach. He maintains that it is useless to design ideal beauty if the architect is ignorant of the physics, resistance, and behavior of the raw materials. Book II will therefore become a treatise **on the science of materials** (analysis of sand, lime, stone, pozzolanic cement, and wood).
- ***commensus... et genera singula symmetriarum:*** Introduction to the architectural theory of the following books. The term *commensus* translates the Greek concept of proportional symmetry (the modular metric correspondence between individual elements and the whole of the work). Vitruvius anticipates the structure of Books III and IV, dedicated entirely to the typology of religious temples and the codification of the classical orders (Doric, Ionic, and Corinthian), thereby closing the general introductory framework of the discipline.

1.7.2 Vitruvius concludes the arrangement of sacred sites by placing the sanctuary of Ceres outside the city and requiring its place to be preserved religiously, with purity and holy customs. The passage does not state that secrecy in the mysteries is the reason for the site. Other temple plots must suit their sacrificial requirements. Finally, the author sets out the treatise's program: materials and their properties are treated first in Book II; the dimensions, orders and different systems *of symmetria follow in* Books III and IV.

Textual note — I.7.2. Krohn's text (1912) is followed: quo ⟨non quolibet⟩ nomine semper homines...; cum religione...; and de earum symmetriis, with ⟨deinde⟩ as an editorial supplement. Rose (1899) prints a different text here—quo non omnes semper homines...; cum religiose.... The difference is recorded because it affects the wording, although it does not alter the passage's general meaning.

4. Rowland and Howe, *Vitruvius*, 32.

Comparative critical apparatus — I.7. Krohn prints sin autem mediterraneo in I.7.1, while other critical texts give mediterranea; both reflect an unstable area of transmission. In I.7.2 the difference is more substantial: Krohn reconstructs quo <non quolibet> nomine semper... cum religione..., whereas Rose and other texts print quo non omnes semper homines... cum religiose.... This edition keeps the difference visible because it affects the syntax of the prescription concerning Ceres. <Deinde> is also retained as an editorial supplement in the final program for the following books.

Historical and religious note — I.7. The distribution of sanctuaries should not be confused with a modern zoning ordinance. Vitruvius combines civic convenience, visibility, proximity to particular public spaces and religious rationalizations attributed to the Etruscan discipline. The commentary distinguishes the text's assertions from later reconstructions of Roman religious urbanism.

Comparative apparatus — I.7. Forum, portus, aedes sacrae and loci communes are distributed according to the city's position and use. The locations assigned to Venus, Vulcan, Mars, Jupiter, Juno and Minerva are retained as religious and urban rationalizations transmitted by Vitruvius; they are not universalised as rules of Roman urban planning.

Synthesis for architects — Book I. The sequence moves from the education of the architectus to the definition of the discipline and then to the urban scale: choice of site, fortification, street orientation and the distribution of public and religious spaces. Modern technical interpretation is offered as comparison, never as a substitute for the ancient reasoning.

The Preface to Book Two (II.Pr.1), one of the most famous literary and anecdotal passages in Vitruvius's work. It recounts the audacious stratagem of the Macedonian architect Dinocrates to attract the attention of Alexander the Great, by presenting himself before the royal court disguised as the mythological hero Hercules.

Critical Interlineation

M. VITRVVIVS POLLIO · DE ARCHITECTVRA · LIBER II

Argumentum Libri II — *On the origin of architecture and civil life, and on building materials: brick, sand, lime, pozzolana, quarry stone, wall patterns (reticulatum, incertum, isódomon, pseudisódomon, émplecton) and woods, with their virtues and defects according to the proportion of natural elements.*

Notice. *— Book II turns from theory to matter. After an anthropological preface on the origins of building — the primitive hut, society born around fire — it treats the materials of construction: brick, sand, lime, the volcanic pozzolana that sets under water, stone and quarries, the methods of walling (opus reticulatum, incertum, the Greek emplekton) and timber. It is the foundational ancient source for Roman building technology, and modern materials science has confirmed much of its account of lime and pozzolanic mortar.*

II.Pr.1 *Dinocrates architectus cogitationibus et sollertia fretus, cum Alexander rerum potiretur, profectus est e Macedonia ad exercitum regiae cupidus commendationis. Is e patria a propinquis et amicis tulit ad primos ordines et purpuratos litteras ut aditus haberet faciliores, ab eisque exceptus humane petît uti quamprimum ad Alexandrum perduceretur. Cum polliciti essent, tardiores fuerunt idoneum tempus expectantes. Itaque Dinocrates ab his se existimans ludi ab se petît praesidium. Fuerat enim amplissima statura, facie grata, forma dignitateque summa. His igitur naturae muneribus confisus vestimenta posuit in hospitio et oleo corpus perunxit caputque coronavit populea fronde, laevum umerum pelle leonina texit, dextraque clavam tenens incessit contra tribunal regis ius dicentis.*

II.Pr.1 Dinocrates[132] the architect, trusting in his ideas and ingenuity, left Macedonia for the army while Alexander was in power, eager to win the king's favor. He brought letters from relatives and friends at home to the leading officers and courtiers, hoping to gain easier access. They received him kindly, and he asked to be brought before Alexander as soon as possible. Although they promised to do so, they delayed while waiting for a suitable occasion. Thinking that they were making a fool of him, Dinocrates sought a resource within himself. He was very tall, with a pleasing face and an impressive, dignified physique. Trusting in these natural gifts, he left his clothes at the inn, anointed his body with oil, crowned his head with poplar leaves, draped a lion's skin over his left shoulder and, holding a club in his right hand, advanced towards the tribunal where the king was administering justice.

1. ***Dinocrates:*** Name of the celebrated Hellenistic architect and urban planner of the late 4th century BC, the architect of Alexandria's urban plan. In other ancient sources (such as Plutarch or Strabo) his name appears spelled with phonetic variants such as *Deinocrates*, *Stasicrates*, or *Cheiromocrates*. — 2. ***purpuratos:*** Technical term from the Macedonian court and the Hellenistic kingdoms (*philoi* or *diadochos*) that designated the high dignitaries, ministers, and generals of the king's utmost confidence, who possessed the privilege of wearing robes dyed royal purple. The popular medieval translation confused the adjective with "purple-colored letters." — 3. ***ab se:*** Philological emendation of the main manuscript tradition. The expression indicates that Dinocrates, seeing the mediation of the courtiers thwarted, decided to rely on his own means and initiative, resorting to his own person as his only shield or "protection " (*praesidium*).

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132 Dinocrates (Δεινοκράτης; transmitted forms Dinocrates and Deinochares) was a Greek architect contemporary with Alexander the Great. Vitruvius devotes the preface to Book II (2.pref.1–4) to him, recounting how he presented himself to the king and proposed carving Mount Athos into a colossal statue, with a city in its left hand and, in its right, a basin collecting the mountain's waters and discharging them into the sea. Alexander rejected the project after asking about land capable of feeding the city, but retained its author. Tradition attributes to Dinocrates the plan of Alexandria, founded in 331 BC, and its orthogonal Hippodamian layout. His identification with the Chirocrates mentioned by Strabo remains disputed, as do the attribution of Hephaestion's funeral pyre at Babylon and of work on the temple of Artemis at Ephesus. In Vitruvius the episode serves an argumentative purpose: it contrasts princely favor with professional competence alone and introduces the author's vindication of his own position.

Academic translation

II.Pr.1 The architect Dinocrates, fully confident in his ideas and skill, set out from Macedonia for the army's military camp in the days when Alexander had gained absolute dominion over the world, eager to obtain royal patronage and recommendation. From his homeland, he brought letters of recommendation signed by his relatives and friends, addressed to the leading officers and high court dignitaries (*purpurati*), in order to facilitate his access to the sovereign. Having been received by them courteously, he begged them to present him to Alexander as soon as possible; however, although they promised to do so, they were indolent and dilatory, waiting for a moment they deemed opportune. Therefore, Dinocrates, suspecting that these officers were making a mockery of him, decided to take matters into his own hands. Since he possessed an imposing stature, a graceful face, and a presence of extraordinary beauty and dignity, trusting in these gifts of nature, he stripped off his clothes at the inn, anointed his entire body with oil, crowned his head with poplar fronds, covered his left shoulder with a lion skin, and, wielding a mace in his right hand, advanced with a firm step directly to the tribunal where the king dispensed justice.

Notes (Explanation of Vitruvius's Text)

4. Marcus Vitruvius Pollio, De *architectura* 2.Pr.1. For the philological study of biographical anecdotes in Hellenistic and Roman technical literature, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 29; and the textual fixation of Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 29.

- ***cum Alexander rerum potiretur: Historical and political setting. The expression rerum potiri (to exercise absolute power) places the action at the height of Alexander the Great's campaigns in the East (c. 332–331 BCE). Vitruvius uses this prologue not only as an entertaining element, but as a metaphor for patronage and the relationship between absolute political power and the design of state architecture.***
- ***primos ordines et purpuratos / ludi:*** An indirect Vitruvian critique of court bureaucracy. The text describes the subtle mechanisms of exclusion at the Macedonian court, where ordinary diplomatic channels (letters of recommendation from the *purpurati*) often stalled in empty promises. Sensing

that he was being manipulated (ludi*)*, Dinocrates breaks official protocol with a visually striking action.

- ***naturae muneribus confisus / oleo corpus perunxit:*** Vitruvius highlights the athletic physique of the Macedonian architect. By anointing himself with oil (oleo *perunxit*), Dinocrates adopts the aesthetic and heroic practices of the athletes of the Greek gymnasiums, highlighting his musculature under the sunlight to impress the audience and Alexander himself, who was a fervent admirer of classical physical beauty.
- ***populea fronde / pelle leonina / clavam tenens:*** Analysis of the **iconographic staging (Theatrical Performance)**. Dinocrates does not disguise himself arbitrarily; he executes a careful visual assimilation with **Hercules (Heracles)**, the quintessential civilizing hero. The elements are unequivocal sacred attributes: the Nemean lion skin (*pelle leonina*) used as a cloak, the club (*clava*), and the crown of white poplar leaves (populea *frons*), a tree consecrated to Hercules after his descent into the Underworld.
- ***Contra tribunal regis ius dicentis:*** The climax of political audacity. Dinocrates interrupts the monarch's most sacred and solemn public act: the administration of justice (*ius dicere*). By bursting into the forum or military camp with the appearance of a living mythological hero, he unsettles the royal security and inevitably forces Alexander's direct attention, breaking through the filter of secretaries and generals.

II.Pr.1 Vitruvius opens his second book with the famous image of Dinocrates of Macedon, an architect who, faced with the indolence and delaying tactics of the royal courtiers (*purpurati*) in presenting him to Alexander the Great, opted for a bold strategy of visual self-promotion. Using his imposing physique, Dinocrates burst into the public court where the monarch dispensed justice (*ius dicentis)*, naked, anointed with oil, and adorned with Herculean attributes — the lion skin, the mace, and the poplar crown — breaking court protocol to force the conqueror's direct patronage (Vitruvius, *De architectura* 2.Pr.1).

5. Rowland and Howe, *Vitruvius*, 33.

Latin text

.2 *Novitas populum cum avertisset, conspexit eum Alexander. Admirans ei iussit locum dari ut accederet, interrogavitque quis esset. At ille: «Dinocrates», inquit, «architectus Macedo, qui ad te cogitationes et formas adfero dignas tuae*

claritati. Namque Athon montem formavi in statuae virilis figuram, cuius manu laeva designavi civitatis amplissimae moenia, dextera pateram quae exciperet omnium fluminum quae sunt in eo monte aquam, ut inde in mare profunderetur».

II.Pr.2 The unusual sight drew the crowd's attention, and Alexander saw him. Astonished, he ordered room to be made for him to approach and asked who he was. "Dinocrates," he replied, "a Macedonian architect, bringing you ideas and designs worthy of your glory. I have designed Mount Athos in the form of a male statue: in its left hand I have represented the walls of a very large city, and in its right a patera, a ritual bowl, to receive the water of all the mountain's rivers and pour it into the sea."[133]

1. ***Athon montem:*** *Greek* accusative of the toponym Athos (the peninsula and calcareous mountain area located in Chalkidiki, north of Greece). The manuscript tradition maintains the original Hellenistic declension adopted by Vitruvius.

Academic translation

II.Pr.2 When that striking novelty diverted the attention of the crowd, Alexander fixed his eyes on him. Filled with admiration, he ordered that a path be cleared for him to approach and questioned him about his identity. He replied: "I am Dinocrates, a Macedonian architect, and I have come to present to you ideas and graphic designs (*forms*) worthy of your sublime clarity and fame. I have, in fact, designed the transformation of Mount Athos, endowing it with the form of a colossal male statue; in its left hand I have outlined the walls of a vast city, while in its right hand it will hold a patera intended to collect the waters of all the streams and rivers that flow from that mountain, so that from there they may cascade down to the sea. "

Notes (Explanation of Vitruvius's Text)

2. Marcus Vitruvius Pollio, De *architectura* 2.Pr.2. For the analysis of the colossal projects of Hellenistic architecture and the rhetoric of royal patronage, see the edition by Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig:

133 The Athos project is discussed on the basis of Vitruvius's account. The parallel ancient testimonies are not identical and should not be merged into a single biography of Dinocrates without indicating their differences.

Teubner, 1899), 29-30; and the textual fixation by Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 29-30.

- ***Novitas populum cum avertisset:*** Dinocrates's astute *performance has an immediate effect.* The term novitas *(*the eccentricity or strangeness of the spectacle) breaks the monotony of the royal court. In Greco-Roman culture, attracting the attention of the crowd (*populus*) was the indispensable first step to capture the interest of the monarch, who operated under the gaze of the public.
- ***Cogitationes et formas:*** Vitruvius employs a key conceptual binomial in his own architectural theory. *Cogitationes* represent the theoretical ideas or mental conception of the design, while *forms* refer to the models, plans, or tangible perspective representations that the architect brought with him to visually persuade the king.
- ***Athon montem in statuae virilis figuram:*** The Mount Athos project constitutes the first major documented example of **anthropomorphic architecture on a territorial scale**, or *land art,* in antiquity. Dinocrates proposed sculpting a mountain over 2000 meters high to mold the figure of Alexander himself (implicitly assimilated to Hercules, reinforcing the disguise with which he presented himself).
- ***manu laeva moenia... dextra pateram:*** The iconographic distribution of the macrostatue follows the conventions of Greek divine and heroic statuary:
  - **Left hand (The city):** Holds the walls of a great city (*civitatis amplissimae moenia*). This image symbolizes the sovereign as ecumenical founder, protector and physical container of civilization over untamed nature.
  - **Right hand (The patera):** Holds a ceremonial bowl or libation dish (*patera*). The technical function of this piece is to act as a gigantic dam or collection vessel that unifies the mountain's hydrographic basins (*omnium fluminum... aquam). By channeling the water and* artistically directing it towards the sea, the monarch is presented not only as a conqueror of peoples, but as an organizer of the forces of nature and the hydrological cycle.

Translation and Commentary

II.Pr.2 After capturing the attention of Alexander the Great thanks to his theatrical entrance, Dinocrates identified himself as a Macedonian architect and presented him with a revolutionary model of colossal urbanism (*forms*). His proposal consisted of carving the promontory of Mount Athos with the physiognomy of a Herculean male colossus that would hold in its left hand the walled enclosure of a great city, while in its right it would hold a monumental collecting patera in charge of unifying the river channels of the mountain to pour them aesthetically into the ocean, linking the glory of the sovereign with the absolute dominion of the natural landscape (Vitruvius, *De architectura* 2.Pr.2).

Historical and Philological Note

1. Marcus Vitruvius Pollio, De *architectura* 2.Pr.2. This passage constitutes one of the earliest testimonies on utopian urbanism and the manipulation of the natural landscape on a monumental scale (*land art*) in Hellenistic antiquity. Dinocrates' project to carve Mount Athos (Athon) The image of Alexander the Great with an anthropomorphic physiognomy that assimilated him to Hercules is also taken up, with subtle variations, by later creators and geographers; see Plutarch, *Alexandri vita* 72.1; and Strabo, *Geographica* 14.1.23. For the textual fixation of the Greek accusative and the analysis of the technical terms cogitationes (mental conception) and formas *(*designs or models), see the critical edition of Valentin Rose, *Vitruvii De architectura libri decem (*Leipzig: Teubner, 1899), 29-30; Fritz Krohn's paleographic review, Vitruvii De *architectura libri decem (Leipzig: Teubner, 1912*), 29-30; and Rowland and Howe, *Vitruvius*, 33, 145–146.

Discussion of the Sources and Terminology:

1. **Parallel Sources:** Contrast Vitruvius's text with the other great sources of antiquity (Plutarch and Strabo) that narrate the same anecdote, which allows us to measure the historical veracity of the story.

1. **Technical Exegesis: Explains the** precise meaning of *forms,* **which** in Vitruvian Latin is not an abstract word, but refers directly to the physical supports of architectural drawing (plans or perspectives).

1. **Bibliographic Authority:** Refers to the reference editions of the Latin text (Rose and Krohn) and to the standard modern English commentary (Rowland - Howe).

Critical Interlineation

.3 *Delectatus Alexander ratione formae statim quaesiit, si essent agri circa qui possent frumentaria ratione eam civitatem tueri. Cum invenisset non posse nisi transmarinis subvectionibus, «Dinocrates», inquit, «attendo egregiam formae compositionem et ea delector, sed animadverto si qui deduxerit eo loci coloniam fore ut iudicium eius vituperetur. Ut enim natus infans sine nutricis lacte non potest ali neque ad vitae crescentis gradus perduci, sic civitas sine agris et eorum fructibus in moenibus affluentibus non potest crescere nec sine abundantia cibi frequentiam habere populumque sine copia tueri. Itaque quemadmodum formationem puto probandam, sic iudico locum inprobandum, teque volo esse mecum, quod tua opera sum usurus».*

II.Pr.3 Delighted by the account of the design, Alexander immediately asked whether there was farmland nearby capable of supplying the city with grain. Learning that it could be sustained only by supplies brought from overseas, he said: "Dinocrates, I appreciate the excellence of your design and take pleasure in it, but anyone who founded a colony there would, I see, be criticized for his judgment. Just as a newborn child cannot be nourished without its nurse's milk or develop through the stages of growing life, so a city cannot grow without farmland and its produce flowing into its walls, maintain a numerous population without abundant food, or sustain its people without supplies. I therefore approve the design but reject the site. Nevertheless, I want you to remain with me, for I shall make use of your services."[134]

1. ***frumentaria ratione:*** A technical expression of Roman administration and economy (linked to the annona and grain supply). Vitruvius projects this Roman concept onto the logistical mindset of Alexander *the* Great to assess the viability of the new polis. — 2. ***transmarinis subvectionibus:*** A term that defines heavy logistical transport by sea. The popular and imprecise translation of the medieval period often rendered it anachronistically as "transoceanic

134Frumentaria ratio concerns the capacity to supply the population with grain. The comparison with an infant deprived of milk turns territorial food supply into a criterion for the viability of a city.

transport, " when strictly speaking it refers to coastal shipping and navigation in the Aegean and Mediterranean Seas.

Academic translation

II.Pr.3 Alexander, delighted by the explanation of the design, immediately asked if there were cultivated fields in the vicinity of the mountain that could sustain the city by supplying wheat (*frumentaria ratio*). When informed that this was impossible unless supplies were supplied by sea (*transmarinis subvectionibus*), he exclaimed: "Dinocrates, I observe with attention the extraordinary composition of your design and I am greatly pleased; but I warn that, if someone were to found a colony in such a place, their critical judgment would be severely censured." Just as a newborn cannot feed or progress through the successive stages of life without its nurse's milk, so too a city cannot prosper without cultivated fields and the abundant flow of the earth's bounty within its walls, nor can it sustain a high population density without an abundance of provisions, nor maintain its population without sufficient reserves. Therefore, while I consider your formal design worthy of approval, I judge the proposed site to be entirely unacceptable. Nevertheless, I want you to remain with me, for I firmly intend to make use of your services.

Notes (Explanation of Vitruvius's Text)

3. Marcus Vitruvius Pollio, *De architectura* 2.Pr.3. For the analysis of the subsistence economy in Hellenistic urbanism and the metaphor of breastfeeding applied to geopolitics, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 30; and the textual fixation of Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 30.

- ***agri circa / frumentaria ratione:*** This passage introduces the fundamental concept of the *hinterland or* surrounding agricultural territory. Alexander the Great demonstrates that urbanism is not a purely aesthetic discipline, but a science of survival. A city cannot exist in a geographical vacuum; it requires an immediate agricultural territory capable of generating surplus grain to feed the non-producing urban population (artisans, soldiers, bureaucrats).
- ***transmarinis subvectionibus / locum inprobandum:*** The danger of external dependence. Relying exclusively on maritime supplies

(subvectiones*)* exposed a Hellenistic city to disaster in the event of naval blockades during wars, seasonal storms, or crop failures in exporting regions. This logistical vulnerability renders the site unsuitable (*locum inprobandum*), however dazzling the architectural proposal.

- ***Ut enim natus infans sine nutricis lacte...:*** Analysis of the **Physiological - Urban Metaphor**. Vitruvius resorts to a medical and biological analogy of Aristotelian origin: the city as a living organism. The agricultural territory (*agri*) is equivalent to the nurse (*nutrix*), and the food that flows into the interior of the walls (*fructibus in moenibus affluentibus*) is the mother's milk (*lac*). Without this constant vital flow, the organic development of the city comes to a sudden halt, preventing the population from growing (*frequently habere*).
- ***formationem probandam... teque volo esse mecum:*** The lucidity of Alexander's patronage. The king demonstrates the ability to separate the architect's technical talent from the geographical infeasibility of his initial project. By retaining Dinocrates in his service (*quod tua opera sum usurus*), Alexander secures for his court a brilliant designer with large-scale thinking, to whom he will later entrust a task where formal genius and ideal geographical conditions will coincide: the founding of Alexandria in Egypt.

II.Pr.3 The outcome of the meeting between the monarch and the architect offers a lesson in economic geography and territorial pragmatism. Despite being fascinated by the aesthetics of the colossus of Mount Athos, Alexander the Great rejected the project due to the absence of a peripheral agricultural territory capable of guaranteeing the sustenance of the population (*frumentaria ratio*). Through an organicist metaphor that compares dependence on external grain to an infant deprived of its nurse's nourishment, the sovereign sanctions the unviability of colonies exclusively dependent on unstable maritime supply lines (transmarinis subvectionibus), although he does incorporate Dinocrates into his entourage of state engineers (Vitruvius, *De architectura* 2.Pr.3).

Latin text

.4 *Ex eo Dinocrates ab rege non discessit et in Aegyptum est eum persecutus. Ibi Alexander cum animadvertisset portum naturaliter tutum, emporium egregium, campos circa totam Aegyptum frumentarios, inmanis fluminis Nili*

magnas utilitates, iussit eum suo nomine civitatem Alexandriam constituere. Ita Dinocrates a facie dignitateque corporis commendatus ad eam nobilitatem pervenit. Mihi autem, imperator, staturam non tribuit natura, faciem deformavit aetas, valetudo detraxit vires. Itaque quoniam ab his praesidiis sum desertus, per auxilia scientiae scriptaque ut spero perveniam ad commendationem.

II.Pr.4 *From then on Dinocrates did not leave the king and followed him to Egypt. There, when Alexander had observed a naturally safe harbor, an excellent emporium, corn fields around the whole of Egypt, and the great benefits of the immense river Nile, he ordered him to found the city of Alexandria in his own name. Thus Dinocrates, commended by his face and dignity of body, attained that nobility. But to me, emperor, nature has not given stature, age has disfigured my face, and illness has sapped my strength. Therefore, since I am deserted by these protections, I hope to attain commendation through the aids of science and writings.*

1. Alexandriam constituere: Refers to the founding of Alexandria in the Nile Delta (c. 331 BCE). Historiography confirms that Dinocrates of Macedon acted as the director of the urban layout and chief engineer (architectus) of the new city, applying a rigorous orthogonal or Hippodamian plan. — 2. imperator: Political vocative addressed directly to Caesar Augustus. Vitruvius uses this military and civil title to appeal directly to the axis of imperial power in Rome, establishing an implicit parallel between the Alexander - Dinocrates and Augustus-Vitruvius relationship. — 3. praesidiis: Military metaphor. Vitruvius defines physical attributes (beauty, youth, strength) as bodily "defenses" or "protections" that open doors at court. Finding himself deprived of them by the passage of time, he transfers the concept of praesidium to the realm of intellectual and scientific production.

Academic translation

II.Pr.4 From that meeting onward, Dinocrates never left the monarch's side and accompanied him on his expedition to Egypt. There, when Alexander observed a port protected by nature itself, a commercial center (*emporium*) with unbeatable conditions, cultivated plains that extended throughout Egypt capable of ensuring the supply of wheat, and the immense logistical advantages offered by the mighty Nile River, he ordered him to found and lay out the city

of Alexandria, naming it after himself. It was in this way that Dinocrates, having won royal favor thanks to the grace of his face and the imposing dignity of his physical presence, achieved such high renown and noble esteem. As for me, Emperor, nature did not endow me with great stature; Old age has disfigured my face, and illness has diminished my physical strength. Consequently, finding myself without those physical credentials, I trust that I can gain your recognition and recommendation by relying on the aid of science and my architectural writings.

Notes (Explanation of Vitruvius's Text)

4. Marcus Vitruvius Pollio, De *architectura* 2.Pr.4. For the study of the urban planning of Alexandria in Egypt and the author's self-representation strategies in relation to Augustus, see Valentin Rose's edition, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 30-31; and Fritz Krohn's fixation of the Latin text, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 30-31.

- ***portum naturaliter tutum / emporium egregium:*** Vitruvius summarizes the geostrategic reasons that made Alexandria the metropolis of the eastern Mediterranean. Unlike the unfeasible project of Mount Athos (analyzed in II.Pr.3), the Egyptian site met the optimal conditions of urban science: natural naval protection against the island of Pharos, commercial connectivity (*emporium*) and an inexhaustible agricultural basin fed by the silt of the Nile.
- ***Fields... grain fields / Nile great utilities:*** The Nile Delta represented the great granary of the ancient world. By combining unlimited agricultural production with the Nile's river infrastructure (which allowed grain to be transported from the interior of Egypt to the ships in the port), Alexander solved the equation he had posed to Dinocrates: the perfect reconciliation between *frumentaria ratio* (food sovereignty) and the monumental projection of political power.
- ***a facie dignitateque corporis:*** Vitruvius closes the Hellenistic anecdote by insisting that the trigger for Dinocrates' success was not initially his technical portfolio, but his spectacular physical stature and his mastery of political theatricality. This observation serves as a springboard to introduce his personal manifesto.

• ***Mihi autem... faciem deformavit aetas, valetudo detraxit vires:*** The Autobiographical Turn and the Rhetoric of **Physical Decline**. Vitruvius presents himself to Augustus as the exact opposite of Dinocrates: an old man (*aetas*), marked by illness (*valetudo*) and devoid of visual appeal or athletic prowess. This confession does not seek compassion, but rather operates under a classical literary convention: the devaluation of the body to extol the imperishable value of the intellect.

• ***Per auxilia scientiae scriptaque:*** The thesis of Vitruvius's treatise. The author proposes to Emperor Augustus a new model of patronage based not on the immediate visual appeal of megalomaniacal projects, but on the solidity of scientific knowledge and the written codification of the laws of architecture. His ten books are, therefore, his own "lion's skin" and his "club": the intellectual instruments with which he aspires to earn immortality and the commendation (*commendatio*) of the sovereign of Rome.

II.Pr.4 The prologue concludes by linking Dinocrates' definitive success with the founding of Alexandria, a site that, unlike Mount Athos, combined a safe natural harbour with the agricultural and logistical potential of the Nile River. Vitruvius takes advantage of this historical resolution to articulate a sharp autobiographical contrast directed at Augustus (*imperator*); acknowledging his lack of the youth, stature, and physical presence that elevated the Macedonian master, the Roman writer claims state patronage based strictly on the rigor of technical knowledge (*scientia*) and the enduring value of his written work as his sole title of architectural nobility (Vitruvius, *De architectura* 2.Pr.4).

5. Ingrid D. Rowland y Thomas Noble Howe, eds., *Vitruvius: 'Ten Books on Architecture'* (Nueva York: Cambridge University Press, 1999), 33-34, 146.

5. Cum autem ⟨quae⟩ primo volumine de officio architecturae terminationibusque artis perscripsi, item de moenibus et intra moenia arearum divisionibus, insequatur ordo de aedibus sacris et publicis aedificiis itemque privatis quibus proportionibus et symmetriis debeant esse uti explicentur, non putavi ante ponendum nisi prius de materiae copiis, e quibus conlatis aedificia structuris et materiationibus perficiuntur, quas habeant in usu virtutes exposuissem quibusque rerum natura e principiis essent temperatae dixissem. Sed antequam naturales res incipiam explicare, de

aedificiorum rationibus unde initia ceperint et uti creverint eorum inventiones ante ponam, et insequar ingressus eorum, qui antiquitates rerum naturae et initia humanitatis et inventiones perquisitas scriptorum praeceptis dedicaverunt. Itaque quemadmodum ab his sum institutus exponam.

5. In the first book I described the architect's duties and the boundaries of the art, as well as city walls and the division of building plots within them. The next subject in order would be the proportions and commensurabilities required for sacred, public and private buildings. Before that, however, I thought it necessary to explain the properties in use of the materials assembled to complete buildings in masonry and timber, and the natural principles of which those materials are composed. Before discussing their nature, I shall first describe the beginnings of building and the development of its inventions. I shall follow those writers who investigated the early history of nature, the beginnings of human society and its inventions, and committed their precepts to writing. I shall explain these matters as I have learned them from those authors.

5. But since in the first volume I wrote about the craft of architecture and the limits of art, as well as about walls and the division of building lots within the walls, and since it is next to be a matter of sacred buildings, public buildings and also private ones — explaining with what proportions and symmetries they should be built —, I did not consider that I should address these subjects before having first set forth the qualities of the materials with which buildings are constructed by means of structures and combinations of materials, and having explained why principles of nature they are tempered.

But before I begin to explain natural phenomena, I will first set forth the origins of construction systems, where they arose from, and how their inventions developed. I will follow in the footsteps of antiquity in the study of the nature of things and of those authors who dedicated the beginnings of humanity and its discoveries to the precepts of writers. Therefore, I will explain as I was instructed by them.

Comparative critical apparatus — II, preface 1–5. Comparison with Rose, Krohn and the Budé edition of Book II (text established and translated by Louis Callebat; manuscript research and critical apparatus by Catherine Jacquemard). The Dinocrates anecdote is retained as Vitruvius's own narrative construction

and is not silently harmonized with parallel accounts. Purpurati denotes high-ranking members of the royal entourage; formae remains open between forms, designs and project representations; frumentaria ratio introduces the capacity to supply food as a condition of settlement; and scientia/scripta structures Vitruvius's final representation of himself.

Exegetical note — Dinocrates and Athos. The colossal project serves as an exemplum of an extraordinary form that cannot, by itself, found a city if the territory cannot sustain it. Alexander's objection connects project, site and food supply, preparing the material program of Book II.

Comparative apparatus — Preface to Book II. The exemplum of Dinocrates and Alexander is retained as a programmatic account of appearance, competence and material resources. The edition distinguishes the episode's rhetorical role from any biographical or architectural reconstruction not demonstrated by the text.

Critical Interlineation

Chapter 1

2.1.1 Homines vetere more ut ferae in silvis et speluncis et nemoribus nascebantur ciboque agresti vescendo vitam exigebant. Interea quodam in loco ab tempestatibus et ventis densae crebritatibus arbores agitatae et inter se terentes ramos ignem excitaverunt, et eius flamma vehementi perterriti qui circa eum locum fuerunt sunt fugati. postea re quieta propius accedentes cum animadvertissent commoditatem esse magnam corporibus ignis teporem, ligna adicientes et îs conservantes alios adducebant et nutu monstrantes ostendebant quas haberent ex eo utilitates. In eo hominum congressu cum profundebantur aliter ⟨atque aliter⟩ e spiritu voces, cotidiana consuetudine vocabula ut obtigerant constituerunt, deinde significando res saepius in usu ex eventu fari fortuito coeperunt et ita sermones inter se procreaverunt.

2.1.1 In the earliest ages of the world, men were born like the wild beasts in forests, caves, and groves, and passed their lives feeding upon wild fare. Meanwhile, in a certain place, trees densely crowded and tossed by storms and winds, and rubbing their branches one against another, kindled fire; and those who were about that place, terrified by the fierce flame, were put to flight. Afterwards, when it had grown quiet, drawing nearer they perceived that the warmth of the fire was of great comfort to their bodies; and, adding wood and so keeping it alive, they brought others to it, and by signs made plain what advantages they had from it. In that gathering of men, as their voices were uttered in differing ways with the breath, they established by daily use words as chance had brought them; then, signifying the things in more frequent use, they came by chance to speak, and thus speech was born among them. [135]

1. ***densae crebritatibus: A*** typically Vitruvian -style phrase describing the high density, thickness, and physical proximity of tree masses in primeval forests. This compact arrangement of the forests is the indispensable mechanical condition for the natural friction generated by the wind to produce the outbreak of fire. — 2. ***hominum congressu:*** A technical term from ancient

135 The origin of fire and language belongs to an ancient genealogy of civilisation. Parallels with Lucretius or other intellectual traditions are comparative; Vitruvius does not declare any precise doctrinal dependence here.

social philosophy to designate the assembly, spontaneous aggregation, or first congregation of human beings. It represents the foundational milestone in the transition from the untamed state of nature to civilized society. — 3. ***sermones:*** A concept that in this context does not define mere solemn speeches, but rather articulated language, interactive conversation, and the social communicative faculty that crystallizes after the fixation of arbitrary words.

Notes (Explanation of Vitruvius's Text)

4. Marcus Vitruvius Pollio, De *architectura* 2.1.1. For the study of ancient theories on anthropogenesis and the development of language, see the critical edition of Fritz Krohn, Vitruvii *De architectura libri decem* (Leipzig: Teubner, 1912), 31-32; and the apparatus of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 31-32.

- ***veteri more ut ferae:*** Vitruvius adopts a strictly materialist and historical perspective on human evolution, radically opposed to Hesiod's providentialist theological myth of the "Golden Age. " The first humans are described as being in a state of wild animality, nomadic, scattered, and lacking the basic tools of civilization. Here, the author aligns himself with the philosophical tradition of Democritus, Epicurus, and, fundamentally, with the doctrine expounded by the Roman poet Lucretius in Book V of his work *De rerum natura*.

- ***demystification*** of fire. In contrast to the Greek myth of Prometheus (who steals fire from the gods to give it to humanity), Vitruvius offers a naturalistic and mechanical explanation of the phenomenon: the accidental friction of tree branches caused by the wind. The driving force of cultural change is not divine intervention, but a physical and fortuitous meteorological phenomenon.

- ***ignis teporem / utilitates:*** Fire acts as the ultimate social catalyst. Upon discovering the physical advantage of heat (*commoditatem ad ignis teporem*), humans overcome their initial fear and learn to domesticate the element by gathering firewood (*ligna adicientes*). Maintaining the hearth requires temporary sedentary behavior and cooperation, forcing isolated individuals to gather in a common place (*hominum congressus*).

- ***vocabula ut obtigerant / sermones procreaverunt:*** Analysis of the **Cratilian-Epicurean Theory of Language**. Vitruvius explains how the birth of civil society is inseparable from the birth of language. Linguistic genesis consists of three well-defined phases:

1. *Primary cries:* Modulations of the voice caused by spontaneous physical or emotional impulses (profundebantur aliter *spiritu voces*).

2. *Arbitrariness and convention:* The random assignment of names to objects according to the chance of daily encounters (*vocabula ut obtigerant constituerunt*), consolidated by collective habit (*cotiedad consuetudine*).

3. *articulation:* The pragmatic repetition oriented towards utility that gives rise to rational dialogue and language itself (*sermones inter se procreaverunt*).

2.1.1 Vitruvius opens the main body of his second book by presenting a materialist and evolutionist theory on the origin of humanity, in line with atomist and Lucretian schools of thought. The passage describes the fundamental transition from a wild and disconnected existence to social cohesion, identifying the accidental domestication of fire — caused by the friction of forest vegetation — and the subsequent gathering of human communities around hearths (*hominum congressus*) as the driving force behind this change. This shared space forced the abandonment of instinctive cries in favor of the conventional establishment of arbitrary linguistic signs, giving rise to the simultaneous birth of society and articulated language (Vitruvius, *De architectura* 2.1.1).

5. Rowland and Howe, *Vitruvius*, 34, 146–147.

2.1.2. This paragraph is one of the most famous texts in Western architectural theory, as it sets out the anatomical and evolutionary conditions that differentiate humans from animals and describes the birth of architecture through the imitation of nature and social competition, giving rise to the theoretical concept of the **primitive hut**.

Critical Interlineation

2.1.2 *Ergo cum propter ignis inventionem conventus initio apud homines et concilium et convictus esset natus, et in unum locum plures convenirent habentes ab natura praemium praeter reliqua animalia ut non proni sed erecti*

ambularent mundique et astrorum magnificentiam aspicerent, item manibus et articulis quam vellent rem faciliter tractarent, coeperunt in eo coetu alii de fronde facere tecta, alii speluncas fodere sub montibus, nonnulli hirundinum nidos et aedificationes earum imitantes de luto et virgulis facere loca quae subirent. Tunc observantes aliena tecta et adicientes suis cogitationibus res novas, efficiebant in dies meliora genera casarum.

2.1.2 The discovery of fire thus first gave rise to gatherings, deliberation and communal life, and brought more people together in one place. Nature had given them an advantage over the other animals: they walked upright rather than bent towards the ground, could contemplate the magnificence of the world and stars, and could handle whatever they wished with their hands and fingers. In that gathering some began to make shelters from foliage, others to dig caves beneath hills, and others, imitating swallows and their nests, to build places of mud and twigs in which to shelter. By observing one another's dwellings and adding new ideas of their own, they made better kinds of huts each day.[136]

Note — II.1.2. Vitruvius continues the account by connecting human assembly with upright posture, manual ability and the observation of constructional solutions. He describes roofs of foliage, caves and shelters of mud and branches inspired, among other models, by swallows' nests.

1. ***concilium et convictus:*** A literal translation of the tradition that read convictus *as* a participle ("they were convinced"). This is a substantive legal and sociological triad of Vitruvius (*conventus, concilium, convictus*): the physical assembly, common deliberation, and cohabitation or shared life under the same roof. — 2. ***non proni sed erecti:*** An expression of philosophical and histological origin that describes bipedalism. Vitruvius treats the upright posture not only as a physical trait, but as an ontological dignity bestowed by nature (*naturae praemium*). — 3. ***manibus et articulis:*** Manual dexterity and digital articulation. Vitruvius brilliantly identifies bipedalism and the freeing of the hands as the two biological and engineering preconditions indispensable for the birth of technology and toolmaking.

136 Upright posture and manual skill form part of the ancient anthropology through which Vitruvius explains the origins of civic life (2.1.2).

Academic translation

2.1.2 Therefore, when, because of the discovery of fire, a first congregation (*conventus*), communal deliberation (*concilium*), and shared life (*convictus)* originated among human beings, and when a large number of individuals gathered in one place — favored by a gift of nature that differentiated them from other animals, namely: not walking bent forward (*proni*), but upright (*erecti*), which allowed them to contemplate the magnificence of the universe and the stars, as well as to manipulate any object with absolute ease through their hands and joints—, within that community, some began to weave roofs with foliage, others to excavate caves at the foot of the mountains, and some, imitating the constructive skill and nests of swallows, to make enclosures of mud and branches where they could take shelter. Later, by observing the roofs of their neighbors and adding new innovations to their own ideas (*cogitationes*), they perfected the different types of huts day by day with better workmanship.

Notes (Explanation of Vitruvius's Text)

4. Marcus Vitruvius Pollio, De *architectura* 2.1.2. For the analysis of physical anthropology in the Roman world and the typological evolution of primitive housing, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 32; and the fixation of the Latin text of Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 32.

- ***naturae praemium / non proni sed erecti:*** The anatomical foundation of culture. Vitruvius aligns himself with the Stoic and Ciceronian tradition (cf. Cicero, *De natura deorum* II.150) in arguing that the erect posture has a dual function: a **cognitive/spiritual one** (to gaze upon the cosmos and the stars, elevating thought) and a **pragmatic /mechanical one** (to free the upper limbs). Animals, being *proni* (looking towards the ground), are determined by their immediate biological needs; human beings, being *erectus*, possess the visual and physical distance necessary to design their environment.
- ***manibus et articulis... facilitater tractarent:*** The hand as a tool of tools. Vitruvius anticipates modern theses of technical anthropology on hominization. The human hand, endowed with versatile joints and digital opposition, allows for *tractatio* (the skilful manipulation of raw materials). Without this anatomical advantage, human intelligence could not have materialized in physical culture or architecture.

- ***Hirundinum nests... imitators:*** The concept of ***Constructive Mimesis***. The origin of architecture does not stem from divine revelation, but from careful observation and imitation of zoology. Primitive humans imitate the technique of swallows (*hirundines*), which mix flexible organic elements (branches, straw) with moist binders (mud, clay). This is the zero degree of masonry: the transition from the simple appropriation of natural space (the cave) to the manufacture of an artificial habitat through the combination of materials.
- ***observantes aliena tecta / adicientes suis cogitationibus:*** The engine of technical progress is social **emulation and cognitive development**. Architecture evolves thanks to two interconnected factors:

1. *Observing others:* Community contact within the *coetus* fosters competition and learning through imitation. Human beings copy the successes of their neighbors.

2. *Mental optimization:* The design process (*cogitation) allows for projecting variations and improvements on what* is observed, which generates a constant morphological evolution (*efficiebant in dies meliora genera casarum*), transforming the rough branch hut into a functional architectural typology.

2.1.2 Vitruvius defines the origin of architecture as stemming from a concatenation of anatomical determinants and dynamics of social emulation. Thanks to the evolutionary advantages of bipedalism (*non proni sed erecti*) and the consequent motor versatility of the hands (*manibus et articulis*), primitive humans managed to overcome the stage of gathering and become agents of transformation of matter. The text places the genesis of building in zoological imitation — particularly of swallows' nests through the amalgamation of mud and reeds —, a primordial process that was accelerated thanks to social coexistence, where the visual exchange of technical solutions and the accumulation of individual cognitive experiences drove the progressive improvement of the hut (*meliora genera casarum*) as a basic typology of human habitat (Vitruvius, *De architectura* 2.1.2).

Latin text (Vitruvius, *On Architecture* 2.1.3)

Cum essent autem homines imitabili docilique natura, cotidie inventionibus gloriantes alius alii ostendebant aedificiorum effectus, et ita exercentes ingenia certationibus in dies melioribus iudiciis efficiebantur. Primumque furcis erectis et

virgulis interpositis luto parietes texerunt. Alii luteas glaebas arefacientes struebant parietes, ***materia eos iugumentantes****, vitandoque imbres et aestus tegebant harundinibus et fronde. Posteaquam per hibernas tempestates tecta non potuerunt imbres sustinere, fastigia facientes,* ***luto inducto*** *proclinatis tectis stillicidia deducebant.*

But since they were of an imitative and teachable nature, daily glorying in their inventions, they pointed out to one another the results of their building; and thus, sharpening their wits in rivalry, they grew day by day of sounder judgment. At first, with forked stakes set up and twigs laid between, they wove their walls with mud. Others built walls of lumps of dried clay, binding them together **with timber**, and, to keep off the rains and the heat, they covered them with reeds and leaves. Afterwards, when the roofs could not withstand the rains through the winter storms, they made gables, and, overlaying them with **mud,** carried off the drippings by the sloping roofs.

Academic translation

2.1.3 Since human beings possess a nature suited to imitation and learning, each day, proud of their inventions, they showed each other the results of their constructions. Thus, exercising their ingenuity through competition, they achieved more refined judgments day after day. At first, they erected forked posts (wooden poles), interlaced branches, and covered the walls with mud. Others built walls by piling up sun-dried clods of mud, lining them with plant materials, and covering them with reeds and foliage for protection from the rain and heat. However, upon discovering that during winter storms these roofs could not withstand the rain, they began to build gabled structures (*fastigia*), covering them with mud and installing sloping roofs (*stillicidia)* so that rainwater could be drained away.

Philological and Technical Analysis (Critical Notes)

- **Human nature:** The ability to observe and learn (*imitabil docilique natura*) is presented as the main engine of technical progress.

Pierre Gros. Wherever identified, a purely encyclopedic note—date and place of birth and general description—is replaced by a brief academic note explaining his relevance as an editor and commentator on Vitruvius.

- **Competition as a catalyst:** Vitruvius emphasizes that progress is not only individual, but social; by competing with each other (*exercentes ingenia certationibus*), individuals constantly raised their standards of constructive quality.
- Material evolution:
  - **Framework system:** The first step was the use of vertical posts (*furcis*) and horizontal support elements (*virgulis*) covered with clay.
  - **Earth walls:** The second stage consisted of the use of blocks or lumps of dry clay (*luteas glaebas*).
- **Tectonic evolution: The need to drain** water was the direct cause of the invention of the **pitched roof** (*proclinatis tectis*). When flat roofs failed during the winter, humans understood the need to create slopes (*fastigia*) to channel water away, thus preventing seepage and protecting the mud structure from erosion.

Bibliography (Critical Reference)

Marcus Vitruvius Pollio, De *architectura* 2.1.3. For the analysis of the technical evolution and typology of the primitive hut in the Vitruvian tradition, see the edition of Valentin Rose, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1899), 32-33; and the textual fixation of Fritz Krohn, *Vitruvii De architectura libri decem* (Leipzig: Teubner, 1912), 32-33.

2.1.4 Latin Text

Haec autem ex îs, quae supra scriptae sunt, originibus instituta esse possumus sic animadvertere, quod ad hunc diem nationibus exteris ex his rebus aedificia constituuntur, uti Gallia, Hispania, Lusitania, Aquitania, scandulis robusteis aut stramentis. Apud nationem Colchorum in Ponto, propter silvarum abundantiam, arboribus perpetuis planis dextra ac sinistra in terra positis, spatio inter eas relicto quanto arborum longitudines patiuntur, conlocantur in extremis partibus earum supra alterae transversae, quae circumcludunt medium spatium habitationis. Tum insuper alternis trabibus ex quattuor partibus angulos iugumentantes et ita parietes arboribus statuentes ad perpendiculum imarum educunt ad altitudinem turres, intervallaque, quae relinquuntur propter crassitudinem materiae, schidiis et luto obstruunt. Item tecta, recidentes ad extremos ⟨angulos⟩ transtra, traiciunt gradatim contrahentes, et ita ex quattuor

partibus ad altitudinem educunt medio metas, quas fronde et luto tegentes efficiunt barbarico more testudinata turrium tecta.

From what has been said above we may see that these things were originally established as has been described, since to this day the buildings of foreign nations are made of such materials: in Gaul, Spain, Lusitania, and Aquitaine, roofed with oak shingles or with thatch. Among the Colchians in Pontus, where forests abound, whole trees are laid flat upon the ground to right and to left, a space being left between them as wide as the length of the trees allows; and upon the outer ends of these, others are laid across, so enclosing the dwelling-space within. Then, binding together the four corners with beams laid alternately, and raising the walls of tree-trunks set plumb above the lower ones, they carry up towers to a height; and the gaps that are left, by reason of the thickness of the timber, they stop with chips and mud. The roofs, drawing in by degrees from the extreme angles, they raise pyramid-fashion; and these they cover with foliage and mud, thus fashioning, after the barbarian manner, the testudinate (covered) roofs of their towers.

Academic translation

" We can observe that these constructions originated in the manner described above, since to this day foreign peoples build their dwellings with these same materials; for example, in Gaul, Hispania, Lusitania, and Aquitania, they use sturdy wooden planks or straw. Among the Colchian people in Pontus, due to the abundance of forests, they place whole trees flat on the ground to the right and left, leaving a space between them proportional to the length of the trunks; on the ends of these they place transverse beams that enclose the central space of the dwelling. Then, overlapping alternating beams on the four sides, they join the corners, and in this way, raising the walls of trees plumb from the base, they erect towers; the gaps left by the thickness of the wood are filled with wood chips and mud." Likewise, as for the roofs, they place transverse beams that recede from the ends, gradually contracting them, and thus raise a pyramidal structure on all four sides towards the center, which, when covered with foliage and mud, creates vaulted roofs in the barbarian style.

Critical and Technical Analysis

- **Ethnography as evidence: Vitruvius uses the observation of "** barbarian " peoples (Gauls, Iberians, Colchians) not as a curiosity, but as

empirical evidence for his evolutionary theory. By observing that these cultures still used thatched roofs or log structures, he confirms that these were the formative stages of human architecture.

- **Colchid technique: The description** details a **construction system using interlocking logs** (*log cabin construction). Whole* trees are placed horizontally and locked at the corners to form a self-supporting structure.
- **Space management: The** use of *schidiae* (wood chips or wedges) and mud to fill the gaps (intervalla*)* between cylindrical logs is a necessary technical solution to guarantee thermal insulation and watertightness of the walls.
- **Evolution of the roof:** The description of the roof describes a **truncated pyramidal covering** (*metas*). By setting back the beams (*gradatim contrahentes*), they manage to create a dome or sloping roof which, once sealed with mud and foliage, acquires a "testudina-like" shape (similar to the shape of a turtle's shell), characteristic of barbarian defensive or storage constructions.

Bibliographic references:

- Marcus Vitruvius Pollio, De *architectura* 2.1.4. Technical references extracted from the critical edition of Fritz Krohn, Vitruvii *De architectura libri decem* (Leipzig: Teubner, 1912), 33-34.

2.1.5 Latin Text

Phryges vero, qui campestribus locis sunt habitantes, propter inopiam silvarum egentes materiae, eligunt tumulos naturales eosque medios fossura detegentes et itinera perfodientes dilatant spatia, quantum natura loci patitur. Insuper autem stipites inter se religantes metas efficiunt, quas harundinibus et sarmentis tegentes exaggerant supra habitationes e terra maximos grumos. Ita hiemes calidissimas, aestates frigidissimas efficiunt tectorum rationes. Nonnulli ex ulva palustri componunt tuguria tecta. Apud ceteras quoque gentes ex cannula pari similique ratione casarum perficiuntur constitutiones. Non minus etiam Massiliae animadvertere possumus sine tegulis, subacta cum paleis terra, tecta. Athenis Areopagi antiquitatis exemplar ad hoc tempus luto tectum; item in Capitolio commonefacere potest et significare mores vetustatis Romuli casa et in arce sacrorum stramentis tecta.

The Phrygians, who dwell in the plains and, for want of timber through the scarcity of forests, choose natural hillocks; these they cleave down the middle with trenches, hollow out passages, and enlarge the space within as far as the

nature of the site allows. Over them they set a framework of logs tied together, which they cover with reeds and brushwood, and heap great mounds of earth above their dwellings. Thus they make their houses very warm in winter and very cool in summer. Some build their huts of marsh sedge. Among other peoples too, and in certain places, dwellings are raised upon the same and like principles. No less may one observe at Massilia roofs without tiles, made of earth kneaded with straw. At Athens, the Areopagus, a relic of antiquity, is to this day roofed with mud; and on the Capitol, the hut of Romulus and the thatched roofs of the shrines upon the citadel can still signify and recall the customs of antiquity.

Academic translation

" The Phrygians, who inhabit flatlands, faced with a scarcity of forests and a lack of building materials, chose natural mounds. They cut these mounds in half with a trench and, when excavating paths, widened the spaces as much as the terrain allowed. Furthermore, by joining logs together, they formed a conical structure (*metas*), which, covered with reeds and vine shoots, they reinforced by piling large mounds of earth on top of the dwellings. These roofing systems ensured very warm winters and very cool summers. Some built their huts with roofs of marsh reeds. Among other peoples, in various locations, huts were constructed using the same or similar principles. Likewise, in Marseille, we can observe roofs without tiles, made of beaten earth mixed with straw." In Athens, the ancient example of the Areopagus still remains covered in mud to this day; similarly, on the Capitoline Hill, the hut of Romulus can remind us of and signify the customs of antiquity, as well as the thatched coverings in the citadel of the sacred objects.

Critical Apparatus and Footnotes

- **tumulos naturales... distinguentes:** Vitruvius describes here the creation of semi-buried or excavated dwellings in mounds (tumuli), a logical adaptation to climates where the lack of wood prevents the construction of elevated structures.
- **metas:** The term refers to the conical or pyramidal shape, similar to a circus goal, which allows for an optimal distribution of the earth load on the wooden structure.

- **ulva palustri:** Refers to an aquatic plant (marsh rushes or grasses) traditionally used as a roofing material due to its impermeability and lightness.
- **Massiliae... subacta cum paleis terra:** Vitruvius cites Marseille as a case where the technique of rammed earth with straw (*adobe or rudimentary rammed earth*) is used as an alternative to fired clay tiles.
- **Romuli casa:** The hut of Romulus (*casa Romuli*) was a sacred site in Rome deliberately preserved in its primitive appearance — straw and wood — to commemorate the austere foundation of the city in contrast to the opulence of the imperial era.

References: Vitruvius, *De architectura*, 2.1.5. (Reference edition: Krohn, F., 1912).

De architectura 2.1.6. Vitruvius synthesizes the definitive step from instinctive need to technique (ars) and human civilization.

Latin text

Ita his signis de antiquis inventionibus aedificiorum sic ea fuisse ratiocinantes possumus iudicare. Cum autem cotidie faciendo tritiores manus ad aedificandum perfecissent et sollertia ingenia exercendo per consuetudinem ad artes pervenissent, tum etiam industria in animis eorum adiecta perfecit ut qui fuerunt in his studiosiores fabros esse se profiterentur. Cum ergo haec ita fuerint primo constituta et natura non solum sensibus ornavisset gentes quemadmodum reliqua animalia, sed etiam cogitationibus et consiliis armavisset mentes et subiecisset cetera animalia sub potestate, tunc vero ex fabricationibus aedificiorum gradatim progressi ad ceteras artes et disciplinas, e fera agrestique vita ad mansuetam perduxerunt humanitatem.

From these tokens, then, we may judge that the building-inventions of the ancients were of this kind, and so reason concerning them. And as, by daily practice, men's hands grew more skilled in building, and as by exercising their wits they attained through habit to the arts, then industry, added to their minds, brought it about that those who were the more diligent in such things should claim to be craftsmen. Since, therefore, these things were thus first established, and since nature had not only endowed mankind with the senses, as it had the other animals, but had also armed their minds with thought and judgment, and had set the other animals beneath their dominion, they advanced by degrees

from the building of houses to the other arts and disciplines, and led humanity from a wild and rustic life to a gentler civilization.

Academic translation

" Thus, we can judge from this evidence that the ancient inventions of architecture were like this. Now, as daily practice in the exercise of construction granted greater dexterity to their hands, and by exercising their ingenuity through habit, they attained mastery of the arts, it then happened that the application of their industry to such minds caused the most studious among them to proclaim themselves artisans (*fabri*). Once these principles were thus established, and considering that nature not only endowed people with senses — as it did with other animals — but also armed their minds with thought and reflection, subjecting other creatures to its power, it was then that, after gradually progressing from building to the rest of the arts and disciplines, they managed to transform their wild and rustic existence into a civilized and peaceful humanity."

Critical Apparatus and Notes

- *tritiores* **manus:** The term tritiores (from *terere*, to rub or wear down) refers to the constant practice that softens or refines movements. It refers to the transition from brute physical effort to refined manual technique.
- **studiosiores fabros:** Vitruvius marks the birth of the specialized craft. The architect or builder is no longer just any individual, but one who, through study and practice (studiosiores*)*, elevates his activity to the level of a recognized profession.
- **cogitationibus et consiliis:** Vitruvius establishes here a hierarchical distinction between animal nature (endowed with senses) and human nature (endowed with reflective reason and strategic planning).
- **mansuetam humanitatem:** This term defines the final stage of civilization: *humanitas* as a state of gentleness (*mansueta*) that arises from social life, the exchange of knowledge and the creation of a built environment.

Bibliographic references:

- Marcus Vitruvius Pollio, De *architectura* 2.1.6.
- Fritz Krohn, Vitruvii De architectura libri decem (Leipzig: Teubner, 1912).

De architectura 2.1.7. It closes the first chapter of the second book, serving as an epilogue to the history of the development of architecture and a technical prologue to the following chapters dedicated to materials.

Latin text

Tum autem struentes animose et aevo prospicientes maioribus cogitationibus ex varietate artium natis, non casas sed etiam domos fundatas et latericiis parietibus aut e lapide structas materiaque et tegula tectas perficere coeperunt; deinde observationibus studiorum e vagantibus iudiciis et incertis ad certas symmetriarum perduxerunt rationes. Posteaquam animadverterunt profusos esse partus naturae et abundantem materiae copiam ad aedificationes ab ea comparatam, tractando nutrierunt et auctam per artes ornaverunt voluptatibus elegantiam vitae. Igitur de his rebus, quae sunt in aedificiis ad usum idoneae, quibusque sunt qualitatibus et quas habeant virtutes, ut potuero, dicam.

Then, schooling their minds and looking forward to greater conceptions born of the variety of the arts, they began to build, not huts, but houses with foundations, with walls of brick or stone, and roofed with timber and tiles; and next, by careful observation, they were led from wavering and uncertain notions to fixed rules of symmetry. When they perceived that nature had brought forth her materials in abundance, and had furnished a plentiful store for building, they tended these with care, and, enlarging them through the arts, adorned the elegance of life with its pleasures. I shall therefore speak, as best I can, of those things which are fit for use in building, with what properties they are endowed, and how they possess their excellences.

Academic translation

"Later, as they became more intellectually inclined and projected more ambitious thoughts born from the variety of the arts, they began to build not only huts, but also houses with foundations, raised with brick or stone walls, and covered with beams and tiles. Then, through observation and study, they managed to move from vague and uncertain judgments to precise systems of symmetry. After noticing that nature offers a profusion of materials and that from it comes the abundance of resources for construction, they cultivated them through technical treatment and, having augmented them through the arts, embellished them to increase the elegance of life. Therefore, I will explain

as best I can which elements used in buildings are suitable for use, what qualities they possess, and what properties (*virtutes*) they offer. "

Critical Apparatus and Notes

- **prospicientes maioribus cogitationibus:** The transition from the rural to the urban requires a new scale of thought: the architect no longer improvises, but projects (*prospicientes*) with a long-term goal.
- **Foundation domes:** Vitruvius marks a fundamental technical milestone: the introduction of foundations (*fundata*). Civilized architecture begins when construction becomes permanent, stable, and technologically complex (use of stone and brick).
- **e vagantibus iudiciis... ad certas symmetriarum rationes:** This is the core of Vitruvian philosophy: the transition from empirical and uncertain trial and error to a normative system (*symmetria)*. Architecture reaches its maturity when it is codified in mathematical rules and exact proportions.
- **voluptatibus elegantiam vitae:** Vitruvius concludes that the ultimate goal of construction technique is human well-being (*voluptas*), elevating the mere need for shelter to the category of elegance and vital refinement.
- **Virtues:** In Vitruvian lexicon, the *virtues* of materials are not moral qualities, but physical properties (resistance, durability, flexibility, load capacity).

Bibliographic references:

- Marcus Vitruvius Pollio, De *architectura* 2.1.7.
- Krohn, Fritz, Vitruvii De architectura libri decem (Leipzig: Teubner, 1912).

Here I present the philological correction, the academic translation and the critical apparatus of paragraph 2.1.8, where Vitruvius defends the methodological structure of **his** treatise against possible criticisms about the order of the contents.

Latin text

Sed si qui de ordine huius libri disputare voluerit, quod putaverit eum primum institui oportuisse, ne putet me erravisse, sic reddam rationem. Cum corpus architecturae scriberem, primo volumine putavi quibus eruditionibus et disciplinis esset ornata ⟨oportere⟩ exponere, finireque terminationibus eius species

et e quibus rebus esset nata dicere. ergo in primo de artis officio itemque quid oporteat esse in architecto, ibi pronuntiavi., in hoc de naturalibus materiae rebus, quem habeant usum, disputabo. Namque hic liber non profitetur unde architectura nascatur, sed unde origines aedificiorum sunt institutae et quibus rationibus enutritae et progressae sint gradatim ad hanc finitionem.

But should anyone wish to dispute the order of this book, thinking that it ought to have been placed first, lest he suppose that I have erred, I will render my reason thus. When I was writing the body of architecture, I thought in the first volume to set forth with what branches of learning and disciplines it is adorned, to define its departments, and to say from what things it has sprung; and there I declared what an architect ought to be. In the first, therefore, I treat of the duty of the art; in this, of the natural properties of materials, and what use they have. For this book does not profess to show whence architecture is born, but whence the origins of building were established, and by what means they were fostered and advanced by degrees to their present condition.

Academic translation

“But if anyone wishes to argue about the order of this book, thinking that it should have been structured differently, lest they believe I have erred, I will give my reason here: in writing the body of architecture, I considered that in the first volume I should explain with what knowledge and disciplines it should be adorned, define the limits of its different categories, and explain from what elements it has arisen. Therefore, I declared there what qualities the architect should possess. Thus, in the first I spoke about the duties of art; in this, I will discuss the nature of materials and their uses. For this book does not intend to explain where architecture originates, but rather where the origins of buildings were established, and by what means they were nurtured and gradually progressed to their present form. ”

Critical Apparatus and Notes

- **Reddam rationem: Vitruvius uses** legal and rhetorical language when apologizing for his structure: he is " giving an account" to the reader for his editorial decision.
- **Corpus architecturae:** He defines his work not as a collection of notes, but as a "body" or organic and complete system.

- **Eruditionibus et disciplinis:** This refers to the catalog of knowledge (mathematics, music, geometry, etc.) that Vitruvius required in Book I for the comprehensive training of the architect.
- **Thematic difference:** Vitruvius clarifies the distinction between Book I (the architect and the theoretical framework of the profession) and Book II (the empirical study of the subject and the evolutionary history of construction), emphasizing that his current objective is the technical genealogy of the building.

Bibliographic references:

- Marcus Vitruvius Pollio, De *architectura* 2.1.8.
- Fritz Krohn, Vitruvii De architectura libri decem (Leipzig: Teubner, 1912).
- Valentin Rose, Vitruvii De architectura libri decem (Leipzig: Teubner, 1899).

For paragraph 2.1.8, which functions as a methodological epilogue where Vitruvius justifies the structural order of his corpus:

Academic Footnote

1. Marcus Vitruvius Pollio, De *architectura* 2.1.8. In this passage, the author makes a conscious defense of architecture as a systematic discipline (corpus *architecturae*). The justification of the order — where Book I establishes the intellectual training of the professional (*eruditionibus et disciplinis*) and Book II addresses the material and historical genesis of building — underscores the Vitruvian transition from abstract theory to the physics of materials. For an analysis of the treatise's editorial structure and the contrast between the architect's *officium* and the nature of *materiae*, see Fritz Krohn's critical edition, Vitruvii De *architectura libri decem* (Leipzig: Teubner, 1912), 34; as well as the commentary by Ingrid D. Rowland and Thomas Noble Howe, *Vitruvius: 'Ten Books on Architecture'* (New York: Cambridge University Press, 1999), 147.

Analysis of the components:

- **Justification:** The note highlights that Vitruvius does not organize his work randomly, but with a clear didactic intention: first the subject (the architect) and then the object (the construction and its materials).

- **Technical Terminology:** Emphasis is placed on the distinction between the "disciplines" (educational background) and the "nature of things" (**naturales** *materiae rebus*), which is the guiding principle of his method.
- **References:** The note integrates both the standard philological fixation (Krohn) and the most authoritative modern reference in English (Rowland and Howe), guaranteeing the required academic rigor.

De architectura 2.1.9. It concludes the introduction to Book II and establishes the epistemological framework of the physics of materials.

Latin text

Ergo ita suo ordine et loco huius erit voluminis constitutio. Nunc revertar ad propositum et de copiis, quae aptae sunt aedificiorum perfectionibus, quemadmodum videantur esse ab natura rerum procreatae quibusque mixtionibus principiorum congressus temperentur, ne obscura sed perspicua legentibus sint, ratiocinabor. Namque nulla materiarum genera neque corpora neque res sine principiorum coetu nasci neque subici intellectui possunt, neque aliter natura rerum praeceptis physicorum veras patitur habere explicationes, nisi causae, quae insunt in his rebus, quemadmodum et quid ita sint, subtilibus rationibus habeant demonstrationes.

This volume, then, will have its constitution in its own order and place. Now I shall return to my purpose and reason concerning the materials suitable for the perfecting of buildings: how they appear to have been brought forth by the nature of things, and by what minglings of their first principles their combinations are tempered; and I shall make this not obscure but clear to my readers. For no kinds of matter, no bodies, no things can come into being without a concurrence of first principles, nor be brought within the understanding; nor, otherwise, can the precepts of the physicists touching the nature of things have true explanations, unless the causes inherent in these things—how and why they are as they are—be demonstrated by subtle reasoning.

Academic translation

“Thus, this volume will have its constitution according to its proper order and place. Now I will return to my purpose and reason about the resources that are suitable for the perfection of constructions, about how they seem to have been brought forth by the nature of things, and by what mixtures of principles the

combinations of their elements are moderated, so that they are not obscure, but clear to the readers. For no kind of matter, body, or object can come into being or be subjected to understanding without the union of its principles; nor does nature allow explanations about reality to gain validity according to the precepts of physics, unless the causes present in such things — the how and the why they are as they are — possess demonstrations based on subtle reasoning. ”

Critical Apparatus and Notes

- **Constitutio:** In this context, it refers to the logical and organizational structure of the treatise.
- **Principiorum coetu.** Vitruvius here uses the vocabulary of the physical principles that he immediately develops by summarizing several Greek doctrines. C*oetus* and *congressus* denote the coming together or combination of those principles. The passage should not be reduced to a single atomist doctrine, since the chapter juxtaposes explanations from Thales, Heraclitus, Democritus/Epicurus and the Pythagorean tradition.
- **Praeceptis physicorum:** Vitruvius demands for architecture the scientific rigor of ancient physics. It is not enough to know the use of materials, but it is essential to demonstrate their underlying causes through "subtle reasoning" (*subtilibus rationibus*).
- **Methodology:** The author emphasizes that his exposition must be "clear to the readers" (*perspicua legentibus), avoiding* academic obscurity in favor of a rational explanation of the physical properties.

Comparative critical apparatus — II.1. The account of fire, human assembly, language and the first buildings is retained as a Vitruvian genealogy, although it admits comparison with Lucretius and other ancient traditions. Densae crebritatibus is an awkward construction that should not be regularized merely for elegance. Nutu and sermones mark the transition from gesture and voice to shared communication; tritiores manus, studiosiores fabri and certas symmetriarum rationes articulate practice, specialization and proportional rules.

Historical and architectural note — II.1. The primitive dwellings attributed to different peoples are literary ethnographic testimonies, not a demonstrated archaeological sequence. Their argumentative function is to show

constructional diversity produced by imitation, experience, available resources and cumulative improvement.

Comparative apparatus — II.1. “Homines veteri more ut ferae…” introduces a conjectural history of the origins of social life and building: fire, conventus, concilium, convictus, language, imitation and the progressive improvement of shelters. It is presented as ancient architectural anthropology, not modern prehistoric archaeology.

Architectural and hermeneutic note — The origins of building. Vitruvius connects primitive architecture with observation and imitation: branches, forked supports, mud, reeds, trunks and roofs precede progressively regularized forms. Comparison with vernacular techniques may be illustrative, but does not prove a universal historical sequence.

References:

Chapter 2

Latin text

Thales primum aquam putavit omnium rerum esse principium. Heraclitus Ephesius, qui propter obscuritatem scriptorum a Graecis ***σκοτεινὸς*** *est appellatus, ignem. Democritus, quique est eum secutus, Epicurus, atomos, quas nostri insecabilia corpora, nonnulli individua vocitaverunt. Pythagoreorum vero disciplina adiecit ad aquam et ignem aera et terrenum. Ergo Democritus, etsi non proprie res nominavit sed tantum individua corpora proposuit, ideo ea ipsa dixisse videtur, quod ea cum sint disiuncta nec laeduntur nec interitionem recipiunt nec sectionibus dividuntur, sed sempiterno aevo perpetuo infinitam retinent in se soliditatem.*

Thales first held water to be the principle of all things. Heraclitus[137] of Ephesus, whom the Greeks **called skoteinos (σκοτεινός)** because of the obscurity of his writings, held fire to be that principle. Democritus and his follower Epicurus proposed atoms, which some Latin writers call indivisible bodies and others individual particles. The Pythagorean school added air and earth to water and fire. Democritus, although he did not name the substances individually but proposed indivisible bodies, seems to have held that these bodies, being separate, cannot be damaged, destroyed or divided by cutting, but retain an inexhaustible solidity throughout eternity.[138]

Academic translation

"Thales was the first to consider water as the principle of all things. Heraclitus of Ephesus, whom the Greeks called 'the obscure' (*σκοτεινός*) because of the obscurity of his writings, pointed to fire. Democritus, and his successor Epicurus, postulated atoms, which our people called indivisible bodies and, equally, individuals. The doctrine of the Pythagoreans, for its part, added air and earth to water and fire. Therefore, although Democritus did not properly name things, but only proposed indivisible bodies, it seems that he affirmed this

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137 Heraclitus of Ephesus (Ἡράκλειτος ὁ Ἐφέσιος), active around the end of the sixth and beginning of the fifth century BCE, was a Presocratic philosopher from Ionia. His writings survive only in fragments and testimonia.

138 Σκοτεινός means "obscure". Atomoi, insecabilia corpora and individua belong to the vocabulary of ancient philosophy.

because, being separate, they suffer no harm, are not destroyed, and are not divided by cuts, but retain within themselves an infinite solidity for all eternity. ”

Critical Apparatus and Notes

• σκοτεινός (skoteinos), “dark” or “obscure,” is the traditional epithet of Heraclitus, referring to the difficulty of his expression. The string ζθνηεηλνο is a modern graphic corruption, not an independently identified manuscript reading.

• **Principium:** Vitruvius identifies the pre-Socratic concept of arche *(fundamental* principle) as the basis on which the physics of materials is built.

• **Atomism:** The mention of Democritus and Epicurus underscores Vitruvius's interest in the corpuscular theory. The idea of matter composed of solid and unalterable "individuals" (atoms) is what explains the strength and durability of building materials.

• **Pythagoreanism:** By adding air and earth, Vitruvius completes the tetralogy of natural elements, which will become the axis of his explanation of why some materials are more suitable than others to bear loads or withstand the weather.

Bibliographic references:

- Krohn, F., ed. *Vitruvii De architectura libri decem*. Leipzig: Teubner, 1912.
- Rose, V., ed. *Vitruvii De architectura libri decem*. Leipzig: Teubner, 1899.

De architectura 2.2.2. Vitruvius justifies the need to understand the nature of materials in order to avoid errors in building practice.

Latin text

Ex his ergo congruentibus, cum res omnes coire nascique videantur, et hae in infinitis generibus rerum naturae sint disparatae, putavi oportere de varietatibus et discriminibus usus earum, quasque haberent in aedificiis qualitates, exponere; uti, cum fuerint notae, non habeant qui aedificare cogitant errorem, sed aptas ad usum copias aedificiis comparent.

Since all things appear to arise from combinations of these principles, yet occur in infinitely different forms in nature, I thought it necessary to explain the varieties of materials, the differences in their uses and their qualities in buildings. With that knowledge, those planning to build can avoid error and obtain materials suited to the work.

Academic translation

" Therefore, since all things seem to be born and formed from the concordance of these principles, and given that in the nature of things they appear differentiated into an infinity of kinds, I judged it necessary to expound their varieties, the differences in their use, and the qualities they possess within buildings; so that, once known, those who plan to build will not fall into error, but will select the resources (*copiae*) most suitable for the utility of their constructions. "

Critical Apparatus and Notes

- **Congruentibus:** Vitruvius refers here to the combination or harmony of the elements (atoms or physical principles) mentioned in the previous paragraph, the basis of the material constitution of the universe.
- **Varietatibus et discriminibus: The author emphasizes the importance of** empirical classification; for the architect, it is not enough to know that the material exists, but he must understand its specific differences in order to assign to each material its appropriate technical function in the work.
- **Aptas ad usum copias:** The ultimate purpose of materials theory is the correct choice (aptas*)*, thus avoiding improvisation and ensuring that the resources used are suitable to guarantee the stability and functionality of the building.

References:

- Krohn, F., ed. Vitruvii De architectura libri decem. Leipzig: Teubner, 1912.
- Rose, V., ed. Vitruvii De architectura libri decem. Leipzig: Teubner, 1899.

Comparative critical apparatus — II.2.1–2. The sequence Thales–Heraclitus–Democritus/Epicurus–Pythagoreans brings distinct physical doctrines together around the problem of principia. Insecabilia corpora and individua explain atomoi and should not be modernised as contemporary atomic physics.

Congruentibus and the mixtiones principiorum provide the transition to the technical classification of materiae.

Philosophical and technical note — Principia. Vitruvius uses ancient physics to argue that the observable properties of materials depend on their constitution. The edition separates that historical explanation from modern materials science.

Comparative apparatus — II.2. The doctrines of Thales, Heraclitus, Democritus/Epicurus and Pythagoras are presented as ancient opinions about the principia rerum. Aqua, ignis, atomi/insecabilia corpora and the doctrine of four elements form the cosmological framework Vitruvius uses before discussing materials. The commentary separates philosophical doxography from materials science.

Textual and philosophical note — Terminology. Σκοτεινός is retained as the Greek epithet of Heraclitus; atomos is explained alongside insecabilia corpora and individua. “Atom” is not translated as though the ancient concept were identical to the entity of modern physics.

Chapter 3

De architectura 2.3.1. Vitruvius begins his technical description of brickmaking (lateres).

Latin text

*Itaque primum de lateribus, qua de terra **duci eos** oporteat, dicam. Non enim de harenoso neque calculoso luto neque sabulone soluto sunt ducendi, quod ex his generibus cum sint ducti primum fiunt graves, deinde cum ab imbribus in parietibus sparguntur, dilabuntur et dissolvuntur, paleaeque in his non cohaerescunt propter asperitatem. Faciendi autem sunt ex terra albida cretosa sive de rubrica aut etiam masculo sabulone. Haec enim genera propter levitatem habent firmitatem et non sunt in opere ponderosa et faciliter aggerantur.*

I shall first discuss bricks and the earth from which **they** should be molded. They should not be made from sandy or gravelly clay or loose sand: bricks of these materials are heavy, break up and dissolve when rain strikes the walls, and do not bind well with straw because of their roughness. They should instead be made from whitish clayey earth, red earth or coarse, firm sand. These materials combine lightness with strength, add little weight to the work and are readily laid up.

Academic translation

" Therefore, I will speak first of bricks, explaining from what kind of earth they should be made. They should not be made of sandy, stony, or loose sand, because, when made from these materials, they are heavy, and, moreover, when they are battered by rain in the walls, they crumble and dissolve, and straw does not adhere to them because of their roughness. Instead, they should be made of white clay (*chalk*), red clay (*rubrica*), or even firm, coarse sand (*masculo sabulone*). For these types, due to their lightness, possess stability, are not heavy in the construction, and are easy to lift. "

Critical Apparatus and Notes

- **duci eos]** The adopted text uses the passive infinitive duci with lateres, “bricks”, as the subject of the dependent statement. A gerundive referring to lateres would be ducendi, not ducenda.
- **Suitable materials:** Vitruvius advises against sandy soils (*harenous*) or calcareous soils with gravel (*calculous*), as they lack plastic cohesion. He proposes, instead, white clay soils (*chalk*) or ferruginous soils (*rubric*), which

offer the necessary structure for the straw, added as a reinforcing element, to fulfill its binding function.

- **masculo sabulone]** Firm, coarse sand in the adopted authorial explanation. The ancient qualitative description should not be replaced without evidence by an exact modern granulometric specification.

Bibliographic references:

In De architectura 2.3.2, Vitruvius details the seasonal and curing conditions necessary to guarantee the technical quality of the bricks.

Latin text

Ducendi autem sunt per vernum tempus et autumnale, ut uno tenore siccescant. Qui enim per solstitium parantur, ideo vitiosi fiunt, quod summum corium sol acriter cum praecoquit, efficit ut videatur aridum, interior autem sit non siccus. Et cum postea siccescendo se contrahit, perrumpit ea quae erant arida. Ita rimosi facti efficiuntur inbecilli. Maxime autem utiliores erunt, si ante biennium fuerint ducti; namque non ante possunt penitus siccescere. Itaque cum recentes et non aridi sunt structi, tectorio inducto rigidoque obsolidate, permanente ipsi sidentes non possunt eandem altitudinem, qua est tectorium, tenere, contractioneque moti non haerent cum eo, sed ab coniunctione eius disparantur. Igitur tectoria ab structura seiuncta, propter tenuitatem per se stare non possunt, sed franguntur, ipsique parietes fortuito sidentes vitiantur. Ideo etiam Uticenses laterem, si sit aridus et ante quinquennium ductus, cum arbitrio magistratus fuerit ita probatus, tunc utuntur in parietum structuris.

Bricks should be molded in spring or autumn so that they dry evenly. Those made at midsummer are defective because the sun rapidly bakes their outer skin, making it appear dry while the interior remains moist. As the interior later contracts in drying, it breaks through the dry surface, leaving the bricks cracked and weak. Bricks are most useful if molded two years before use, since they cannot dry thoroughly sooner. If fresh, undried bricks are built into a wall and coated with plaster that then sets hard, the bricks continue to settle and cannot retain the plaster's height. Their shrinkage separates them from it; the plaster, detached from the masonry and too thin to support itself, breaks, while the settling walls are also damaged. For this reason the people of Utica use bricks in walls only after they have dried for five years and have been approved by a magistrate's inspection.

Academic translation

" They must be made (*ducendi*) during the spring and autumn, so that they dry evenly. Those prepared during the solstice are defective because, when the sun violently bakes their outer layer, it makes them appear dry, even though the interior is not. Then, as they contract during the final drying, the already dry crust breaks, leaving the bricks cracked and weakened. They are much more useful, however, if they have been made two years in advance, since they cannot dry completely before then. Therefore, if they are used when they are still fresh and not well dried, when the coating (*tectorio*) is applied and hardened, the bricks settle and cannot maintain the same height as the coating; as they move due to contraction, they do not adhere to it and separate from their joint." Thus, the facing, being separated from the structure, cannot support itself due to its thinness and cracks, deteriorating the walls themselves as they settle unevenly. For this reason, the inhabitants of Utica only allow the use of bricks in their structures if they are thoroughly dried, have been manufactured five years prior, and have the approval of the magistrate.

Critical Apparatus and Notes

- **Ducendi (to be made):** Vitruvius uses the verb *ducere* (to lead/form) to refer to the technical process of molding clay.
- **Solstice (solstitium):** Excessive summer heat is discouraged because it causes uneven drying: the outer surface becomes brittle while the core retains moisture, which generates cracks (*rimosi*) as the material contracts.
- **Settlement (sidentes):** The author warns about the physical contraction of fresh brick. If the facing (*tectorio*) hardens on damp bricks, the subsequent shrinkage of these bricks causes a separation between the supporting structure and the finishing layer, resulting in cracks.
- **The Utica model (Uticenses):** Vitruvius praises the technical legislation of the city of Utica (in North Africa), which established a mandatory five-year drying period and quality control supervised by magistrates, guaranteeing structural safety.

Bibliographic references:

3. fiunt autem laterum genera tria. unum quod graece Lydium appellatur, id est quo nostri utuntur, longum sesquipede, latum pede. ceteris duobus Graecorum aedificia struuntur. ex his unum πεντάδωρον, alterum τετράδωρον dicitur. δῶρον

autem Graeci appellant palmum, quod munerum datio graece δῶρον appellatur, id autem semper geritur per manus palmum. ita quod est quoquoversus quinque palmorum pentadoron, quod quattuor tetradoron dicitur, et quae sunt publica opera πεντάδωρον, quae privata τετράδωρον struuntur.

3. Now there are three kinds of bricks. One which is called Lydian in Greek, that is, which our people use, is a foot and a half long and a foot wide. With the other two Greek buildings are built. Of these one is called pentadoron, the other tetradoron. But the Greeks call doron a palm, because the giving of gifts is called doron in Greek, and this is always done with the palm of the hand. So that which is five palms in each direction is called pentadoron, that which is four is called tetradoron, and which are public works are built pentadoron, and which are private tetradoron.[139]

Three kinds of bricks are made. The Lydian brick used by our people is a foot and a half long and one foot wide. The two other kinds are used in Greek buildings: pentadoron and tetradoron. The Greeks call the palm doron, associating it with the giving of gifts, which is done with the palm of the hand. A square brick of five palms on each side is pentadoron; one of four palms is tetradoron. Public buildings use the former, private buildings the latter.[140]

4. fiunt autem cum his lateribus semilateria, quae cum struuntur, una parte lateribus ordines, altera semilateres ponuntur. ergo ex utraque parte ad lineam cum struuntur, alternis coriis parietes alligantur et medii lateres supra coagmenta conlocati et firmitatem et speciem faciunt utraque parte non invenustam. Est autem in Hispania ulteriore civitas Maxilua, et Callet, et in Asia Pitane, ubi lateres cum sunt ducti et arefacti, proiecti natant in aqua. natare autem eos posse ideo videtur quod terra est de qua ducuntur pumicosa. ita cum est levis, aere solidata non recipit in se nec combibit liquorem. igitur levi raraque cum sit proprietate, quocumque pondere fuerit cogitur ab rerum natura quemadmodum pumex uti ab aqua sustineatur. sic autem magnas habent

139 Πεντάδωρον and τετράδωρον express modules of five and four palms. Modern metric equivalents depend on the standard adopted and must be identified as editorial conversions.

140 Both Vitruvius and Pliny mention three types of brick: Lydian, tetradoron and pentadoron (Adam 1996, 64; Cairoli 2004, 152; Vitruvius 1995, 103). So-called half-bricks were also manufactured. When the bricks are laid level, one above another, courses of full bricks alternate with courses of half-bricks (Vitruvius 1995, 104).

utilitates, quod neque in aedificationibus sunt onerosi, et cum non patiantur penetrare in corpus umidam potestatem, a tempestatibus non dissolvuntur.

4. Half-bricks are made along with these bricks. In laying them, courses of full bricks are placed on one face and half-bricks on the other. With both faces built to the line and the courses alternating, the walls are bonded: the middle of a brick lies over the joint below, giving both strength and an attractive appearance on each face. At Maxilua and Callet in Further Spain, and at Pitane in Asia, bricks, once molded and dried, float when thrown into water. This appears to be because the earth from which they are made is pumice-like: light and consolidated with air, it neither admits nor absorbs water. Being naturally light and porous, yet resistant to moisture entering their substance, such bricks are supported by water like pumice, whatever their total weight. They have great advantages: they do not burden buildings, and storms do not dissolve them.

Along with these bricks, half-bricks are manufactured (semi-bricks); when the wall is built, whole bricks are placed in one row and half-bricks in the other. Thus, when they are laid plumb on both faces, the walls are bonded in alternating courses, and the centers of the bricks, placed over the joints, give the wall firmness and a pleasing appearance on both sides.

At Maxilua and Callet in Further Spain, and at Pitane in Asia, bricks that have been molded and dried float when thrown into water. The earth used is pumice-like: light and consolidated with air, it neither admits nor absorbs water. Its light, porous substance prevents moisture from entering, so that water supports the bricks as it supports pumice, whatever their total weight. They therefore have great advantages: they add little load to buildings and are not dissolved by storms.

Comparative apparatus — II.3. Later here denotes the molded, air-dried brick described by Vitruvius. The selection of earth, seasonal drying and three genera laterum are checked. Lydium measures sesquipede by pede; πεντάδωρον and τετράδωρον are retained as Greek metrological names and explained without being silently replaced by centimeters.

Chapter 4

1. In caementiciis autem structuris primum est de harena quaerendum, ut ea sit idonea ad materiem miscendam neque habeat terram commixtam. Genera autem harenae fossiciae sunt haec: nigra, cana, rubra, carbunculus. Ex his quae in manu confricata fecerit stridorem, erit optima; quae autem terrosa fuerit, non habebit asperitatem. Item si in vestimentum candidum ea coniecta fuerit, postea excussa vel icta id non inquinarit neque ibi terra subsiderit, erit idonea.

1. For rubble masonry, the first requirement is sand suitable for mixing mortar and free from earth. The kinds of pit sand are black, gray, red and carbunculus. The best sand makes a gritty sound when rubbed in the hand; sand mixed with earth lacks that roughness. If sand is thrown onto a white cloth and shaken off, leaving neither a stain nor a deposit of earth, it is suitable.[141]

materiam / materiem] The Spanish edition notes the alternative forms materiam and materiem, the latter being printed in its running text and in Krohn (1912, 35) and Rose (1899, 39). These are alternative accusative forms; no particular manuscript is assigned here.

fossiciae] The Spanish edition juxtaposes fossilis and fossicia with this lemma as variable forms. Krohn (1912, 35) and Rose (1899, 39) print fossiciae in the passage. The source note supplies no identifiable witness for the alternatives.

carbunculus] Krohn (1912, 35) and Rose (1899, 39) print carbunculus; their apparatuses report carbunculum under H and S. This is evidence reported by the printed apparatuses, not a fresh inspection of those manuscripts. The Spanish edition also mentions carboneus without identifying a witness; that form is retained as an unverified authorial report, not established as a manuscript reading.

confricata] The adopted word means "rubbed", describing the test performed in the hand. The Spanish edition calls it the majority reading; that numerical claim about the manuscript tradition is not established by the source note.

stridorem] The characteristic grating or crunching sound made by clean sand when rubbed.

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141 Carbunculus/carbuncularis is a problematic ancient designation for a variety of sand; a modern geological identification not specified by the text is not imposed.

terrosa] "Earthy" or "mixed with earth". The Spanish edition mentions terrea as an alternative without specifying an edition or witness; no manuscript attribution is made here.

subsederit] The Spanish edition juxtaposes subsederit and subsistat. The printed running texts of Krohn (1912, 36) and Rose (1899, 39) have subsiderit. The source note does not identify documentary support for subsistat.

In masonry work, the first thing to examine is the sand, to ensure it is suitable for mixing with the mortar and does not contain earth. The types of quarry sand are: black, gray, red and carbunculus. Of these, the best will be the one that crackles when rubbed in the hand; on the other hand, earthy sand will lack roughness. Likewise, sand that, when spread on a white cloth and then shaken or beaten, leaves no stain or residue of earth, will be suitable.

2. Sin autem non erunt harenaria, unde fodiatur, tum de fluminibus aut e glarea erit excernenda, non minus etiam de litore marino. Sed ea in structuris haec habet vitia: difficulter siccescit, neque onerari se continenter paries patitur, nisi intermissionibus requiescat, neque concamerationes recipit. Marina autem hoc amplius, quod etiam parietes, cum in îs tectoria facta fuerint, remittente se salsugine eorum dissolvuntur.

But if there are no sand pits from which it can be dug, sand must be sifted from rivers or gravel, and likewise from the seashore. In masonry it has these defects: it dries with difficulty, the wall cannot tolerate continuous loading unless it rests at intervals, and it cannot support vaults. Sea sand has the further disadvantage that walls, after they have been plastered, break down as their salinity is released.

harenaria] Sand pits or deposits. The Spanish edition also records harenariae and arenaria as variable forms, without identifying witnesses; the printed texts of Krohn (1912, 36) and Rose (1899, 39) read harenaria here.

excernenda] Sand to be sifted or separated out. The Spanish edition also lists excerenda and eligenda without documentary identification; neither is adopted here as a verified manuscript reading.

paries patitur] The adopted singular wording means that the wall tolerates or permits loading. The Spanish edition also mentions parietes patiuntur as a reading of unspecified codices. The witnesses for that plural phrase are not identified in the source note, so it is not attributed to a manuscript here.

concamarationes / concamerationes] The forms concern vaulted construction. Rose (1899, 39) prints concamarationes; Krohn (1912, 36) prints concamerationes. The Spanish edition favors concamerationes in its running text and notes the alternative spelling. This is a difference between identifiable printed texts, not a new manuscript collation.

remittentes salsuginem] the Spanish edition's lexical note records remittentem salsuginem as an alternative without identifying a witness. The actual printed difference is broader: Rose (1899, 39) has remittentes salsuginem corium dissolvunt, whereas Krohn (1912, 36) has remittente se salsugine eorum dissolvuntur, the constitution followed by the Spanish edition's running text. The word forms and the different objects of the deterioration are not silently conflated.

If there are no sand pits from which to extract it, sand must be sifted from rivers, gravel beds or the seashore. Such sand, however, has these defects in construction: it dries slowly, and a wall cannot be loaded continuously unless it is allowed intervals of rest; it does not support vaults. Sea sand has the further disadvantage that, when walls are plastered, the release of salt damages their surface coating.

3. fossiciae vero celeriter in structuris siccescunt, et tectoria permanent, et concamerationes patiuntur, sed eae quae sunt de harenariis recentes. si enim exemptae diutius iacent, ab sole et luna et pruina concoctae resolvuntur et fiunt terrosae. ita cum in structuram coiciuntur, non possunt continere caementa, sed ea ruunt et labuntur oneraque parietes non possunt sustinere. recentes autem fossiciae cum in structuris tantas habeant virtutes, eae in tectoriis ideo non sunt utiles quod pinguitudini eius calx commixta propter vehementiam non potest sine rimis inarescere. fluviatica vero, propter macritatem uti signinum, liaculorum subactionibus in tectorio recipit soliditatem.

3. Pit sand, by contrast, dries quickly in masonry, allows plaster to remain sound and supports vaulting, provided it is fresh from the pit. If left exposed too long, sun, moon and frost break it down and make it earthy. Used in masonry in that condition, it cannot bind the rubble: the stones fall and slip, and the walls cannot carry their loads. Although fresh pit sand has these advantages in masonry, it is unsuitable for plaster because its rich texture, mixed with lime, dries too vigorously to avoid cracking. River sand, by contrast, because of its

leaner texture, acquires a firm surface in plaster under the action of polishing tools, as does signinum.

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Comparative critical apparatus — II.4. Harena fossicia, fluviatica and marina are retained as ancient categories of provenance and behavior. Carbunculus/carbuncularis is a difficult designation, and a modern geological identification is not imposed. The tests by friction and a white cloth are retained as the text's empirical criteria.

Comparative apparatus — II.4. Harena is classified by provenance and behavior: pit sand (nigra, cana, rubra and carbunculus), river sand and sea sand. Vitruvius's tests—grating when rubbed, absence of earth and behavior on drying—are retained as ancient empirical criteria. They are not automatically equated with modern granulometry or petrography.

Construction note — Sand and mortar. Vitruvius distinguishes fresh pit sand from river or sea sand, relating each to uses and defects. Technical commentary may explain cohesion, salts or shrinkage as modern comparisons, but does not replace the causes formulated in the text.

Chapter 5

1. De harenae copiis cum habeatur explicatum, tum etiam de calce diligentia est adhibenda, uti de albo saxo aut silice coquatur; et quae erit ex spisso et duriore, erit utilis in structura, quae autem ex fistuloso, in tectoriis. Cum ea erit extincta, tunc materia ita misceatur, ut, si erit fossicia, tres harenae et una calcis infundatur; si autem fluviatica aut marina, duo harenae, una calcis coiciatur. Ita enim erit iusta ratio mixtionis temperaturae. Etiam in fluviatica aut marina si qui testam tunsam et succretam ex tertia parte adiecerit, efficiet materiae temperaturam ad usum meliorem.

1. Having explained the supplies of sand, I must also discuss lime, which should be burned from white stone or silex. Lime from dense, harder stone is useful in masonry; lime from porous stone is useful in plaster. Once the lime has been slaked, mix the mortar in these proportions: three parts sand to one part lime when pit sand is used, or two parts sand to one part lime when river or sea sand is used. These give the correct balance of the mixture. Adding one-third of crushed and sifted potsherd to river- or sea-sand mortar improves its composition for use.[142]

fistuloso] Porous stone, with tube-like passages or cavities.

in tectoriis] "In plasterwork" or "in coatings". The Spanish edition also records in tectorio without identifying the witness; the singular and plural are not assigned to particular manuscripts here.

infundantur] the Spanish edition's lexical heading uses this plural form and explains the act of pouring or mixing. Its running text and Krohn (1912, 36) print the singular infundatur. The discrepancy between heading and running text is retained explicitly.

fluviatica aut marina] The adopted wording coordinates the two provenances: river sand or sea sand.

coiciantur / coniiciantur] The Spanish edition records these as alternative spellings of the verb of putting in or mixing. Its running text and Krohn (1912,

142 The transmitted proportions are an ancient recipe rather than a contemporary standardized mortar specification.

36) use the singular coiciatur. No manuscript distribution of the spellings is asserted here.

testam tunsam et succretam] Crushed and sifted tile or pottery. The semantic explanation is retained without turning the authorial Spanish edition's description of the wording as "very stable" into an unsupported claim of manuscript unanimity.

ex tertia parte] "By a third part". The wording expresses a proportional addition, but does not by itself justify a single modern recipe unless the quantity to which the proportion refers is specified.

Having explained the supplies of sand, I must also discuss lime, which should be burned from white stone or silex. Lime from dense, harder stone is useful in masonry; lime from porous stone is useful in plaster. Once the lime has been slaked, mix the mortar in these proportions: three parts sand to one part lime when pit sand is used, or two parts sand to one part lime when river or sea sand is used. These give the correct balance of the mixture. Adding one-third of crushed and sifted potsherd to river- or sea-sand mortar improves its composition for use.

2. Quare autem cum recipit aquam et harenam calx, tunc confirmat structuram, haec esse causa videtur, quod e principiis, uti cetera corpora, ita et saxa sunt temperata. Et quae plus habent aeris, sunt tenera; quae aquae, lenta sunt ab umore; quae terrae, dura; quae ignis, fragiliora. Itaque ex his saxa si, antequam coquantur, contusa minute mixta harenae in structuram coiciantur, non solidescunt nec eam poterunt continere. Cum vero coniecta in fornacem ignis vehementi fervore correpta amiserint pristinae soliditatis virtutem, tunc exustis atque exhaustis eorum viribus relinquuntur patentibus foraminibus et inanibus.

The reason why lime, on receiving water and sand, strengthens masonry appears to be that stones, like other bodies, are compounded from the elements. Those containing more air are soft; those containing more water are pliant through moisture; those containing more earth are hard; those containing more fire are more brittle. If such stones, before firing, are finely crushed, mixed with sand and put into masonry, they do not set and cannot hold it together. When placed in a kiln and seized by the violent heat of the fire, however, they lose the strength of their original solidity: their powers are burned out and exhausted, leaving open pores and voids.

Lime gives strength when it receives water and sand because stones, like other bodies, are composed of the elements. Stones rich in air are soft; those rich in water are pliant through moisture; those rich in earth are hard; and those rich in fire are more brittle. Crushed and mixed with sand before firing, they do not set or hold masonry together. When exposed to the kiln's intense heat, however, they lose their former solidity, and their burned-out substance is left with open pores and voids.

3. (Ideo autem, quo pondere saxa coiciuntur in fornacem, cum eximuntur, non possunt ad id respondere, sed cum expenduntur, permanente ea magnitudine, excocto liquore circiter tertia parte ponderis inminuta esse inveniuntur.) Ergo liquor, qui est in eius lapidis corpore, et aer cum exustus et ereptus fuerit, habueritque in se residuum calorem latentem, prius quem ex ignis vi recepit, intinctus in aqua, umore penetrante in foraminum raritates, confervescit et ita refrigeratus reicit ex calcis corpore fervorem. Igitur cum patent foramina eorum et raritates, harenae mixtionem in se corripiunt et ita cohaerescunt siccescendoque cum caementis coeunt et efficiunt structurarum soliditatem.

(Thus stones cannot weigh the same when removed from the kiln as when put into it: weighed after firing, they are found to have lost approximately one-third of their weight, while retaining the same volume, because their liquid has been driven off.) Once the liquid and air in the stone have been burned out and removed, the latent heat remaining in it, previously received from the force of the fire, causes it to seethe when immersed in water, as moisture penetrates the open pores. On cooling in this way, it expels the heat from the substance of the lime. Its pores and voids, now open, take up the sand mixture and cohere; as they dry, they bind with the rubble and produce the solidity of the masonry.

Textual note — II.5.2–3. The Spanish edition follows the sequence printed by Krohn (1912, 37): the weight-loss sentence stands parenthetically at the opening of II.5.3, before the account of immersion, latent heat and the absorption of sand. Rose (1899, 40–41) places the immersion account before the weight-loss sentence. Both accounts are retained here, with the running text and translation ordered according to the authorial Spanish edition. In the phrase concerning latent heat, Krohn prints prius quem ex ignis vi recepit, "which it had previously received from the force of the fire". the Spanish edition's translation "antes de recibir la fuerza del fuego" reverses that temporal relation; the English follows

the checked Latin, while this note records the discrepancy. The account remains an explanation in ancient natural philosophy, not a modern chemical description.

Comparative critical apparatus — II.5. The transmitted proportions are retained: three parts pit sand to one part lime; two parts river or sea sand to one part lime, with the possible addition of a third part of crushed and sifted pottery. The physics of pores, heat, water and weight loss is explained historically, without substituting modern chemistry.

Comparative apparatus — II.5. Calx is obtained by burning white stone or silex; Vitruvius distinguishes dense stone for structura and porous stone for tectoria. The ancient mixing proportions for pit sand as against river or sea sand are retained without being silently converted into contemporary proportions by mass.

Physical and chemical note — Lime. Vitruvius's explanation of the loss and recovery of virtutes belongs to the ancient theory of elements. The edition may explain calcination, slaking and carbonation separately, but does not attribute those modern categories to Vitruvius or use them to correct his causality.

When the liquid and air within the stone have been burned out and a latent heat remains from the fire, immersion in water allows moisture to enter the open pores. The material seethes and, as it cools, releases the heat from the lime. This explains why stones removed from the kiln, though retaining their volume, have lost about one-third of their weight as their liquid was driven off. Their open pores take up the sand mixture; as it dries, the lime coheres with the rubble and gives the masonry its solidity.

Chapter 6

1. *Est etiam genus pulveris quod efficit naturaliter res admirandas. nascitur in regionibus Baianis in agris municipiorum quae sunt circa Vesuvium montem. quod commixtum cum calce et caemento non modo ceteris aedificiis praestat firmitates, sed etiam moles cum struuntur in mari, sub aqua solidescunt. hoc autem fieri hac ratione videtur quod sub his montibus et terrae ferventes sunt et fontes crebri, qui non essent, si non in imo haberent aut e sulphure aut alumine aut bitumine ardentes maximos ignes. igitur penitus ignis et flammae vapor per intervenia permanans et ardens efficit levem eam terram, et ibi quod nascitur tofus exsurgens est sine liquore. ergo cum tres res consimili ratione ignis vehementia foratae in unam pervenerint mixtionem, repente recepto liquore una cohaerescunt et celeriter umore duratae solidantur, neque eas fluctus neque vis aquae potest dissolvere.*

1. There is also a kind of powder[143] that naturally produces remarkable effects. It occurs in the region of Baiae and around the towns near Mount Vesuvius. Mixed with lime and rubble, it strengthens ordinary buildings and even causes harbour works built in the sea to harden under water. This appears to happen because beneath those mountains lie hot earth and numerous springs, which could not exist without great subterranean fires burning in sulphur, alum or bitumen. The fire and heat of the flame pass through the interstices, burning and lightening the earth; the tuff formed there is likewise free from liquid. When three substances similarly altered by intense fire are brought into one mixture and suddenly receive water, they cohere and harden rapidly through moisture, so that neither waves nor the force of water can break them down.[144]

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143 Pozzolans are siliceous or aluminosiliceous materials of volcanic origin which, mixed with lime, set in the presence of water; they form the basis of Roman opus caementicium.

144 The hydraulic property of pulvis is explicit in Vitruvius; the modern chemical explanation of the pozzolanic reaction belongs to the commentary, not the translation.

which could not exist without great subterranean fires burning in sulphur, alum or bitumen. The fire and heat of the flame pass through the interstices, burning and lightening the earth; the tuff formed there is likewise free from liquid. When three substances similarly altered by intense fire are brought into one mixture and suddenly receive water, they cohere and harden rapidly through moisture, so that neither waves nor the force of water can break them down.

2. ardores autem esse in his locis etiam haec res potest indicare quod in montibus Cumanorum Baianis sunt loca sudationibus excavata, in quibus vapor fervidus ab imo nascens ignis vehementia perforat eam terram per eamque manando in his locis oritur et ita sudationum egregias efficit utilitates. non minus etiam memorantur antiquitus crevisse ardores et abundavisse sub Vesuvio monte et inde evomuisse circa agros flammam. ideoque tunc quae spongia sive pumex Pompeianus vocatur excocto ex alio genere lapidis in hanc redacta esse videtur generis qualitatem.

2. The existence of heat in these places is also shown by the chambers excavated for sweat baths in the hills of Cumae and Baiae. Hot vapor rising from below penetrates the earth through the force of fire, flows through it and emerges in the chambers, making them very effective for sweating. It is also recorded that in ancient times heat increased beneath Vesuvius and that flames spread from it over the surrounding countryside. What is called sponge-stone or Pompeian pumice therefore appears to have been transformed by burning from another kind of stone into its present character.

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3. id autem genus spongiae quod inde eximitur non in omnibus locis nascitur, nisi circum Aetnam et collibus Mysiae quae a Graecis κατακεκαυμένη nominatur et si quae eiusdem modi sunt locorum proprietates. si ergo in his locis aquarum ferventes inveniuntur fontes et montibus excavatis calidi vapores, ipsaque loca ab

antiquis memorantur pervagantes in agris habuisse ardores, videtur esse certum ab ignis vehementia ex tofo terraque, quemadmodum in fornacibus ex calce, ita ex his ereptum esse liquorem.

3. But that kind of sponge which is taken from there does not grow in all places, except around Etna and the hills of Mysia which the Greeks call κατακεκαυμένη and if there are any properties of the same kind in the places. Therefore if in these places boiling springs of water are found and hot vapors are found in excavated mountains, and if in the same places ancient people are mentioned as having had burnings pervading the fields, it seems certain that the liquid was extracted from the tuff and earth by the force of the fire, just as in kilns from lime, so from these.

That kind of spongy stone (pumice) extracted from there is not found everywhere, but only around Mount Etna and among the hills of Mysia, which the Greeks call " the burnt one " (Katakekaumene), and in places with such properties. If, then, in these places there are hot springs and burning steam in the excavations, and it is known from the ancients that there were also fires that spread through the fields, it seems certain that the moisture has been extracted from the tufa and the earth by the force of the fire, just as from lime in the kiln.

4. igitur dissimilibus et disparibus rebus correptis et in udam potestatem conlatis, calida umoris ieiunitas aqua repente satiata latenti calore confervescit et vehementer efficit ea coire celeriterque communibus corporibus unam soliditatis percipere virtutem. Relinquetur desideratio, quoniam item sunt in Etruria ex aqua calida crebri fontes, quid ita non etiam ibi nascitur pulvis, e quo eadem ratione sub aqua structura solidescat. itaque visum est antequam desideraretur de his rebus quemadmodum esse videantur exponere.

4. When these unlike substances are brought together, their hot, moisture-starved material is suddenly supplied with water. Their latent heat causes the mixture to seethe, binds the components strongly together and quickly gives them a single, solid character. A question remains: since Etruria also has many hot springs, why does it not produce a powder that enables masonry to harden under water in the same way? I have therefore thought it appropriate to explain the matter before the question is asked.

When unlike materials are brought together, their hot, moisture-starved substance is suddenly satisfied by water. Their latent heat makes the

mixture seethe, strongly binds its components and quickly gives them a single solid character.

5. omnibus locis et regionibus non eadem genera terrae nec lapides nascuntur, sed nonnulla sunt terrena, alia sabulosa itemque glareosa, aliis locis harenosa non minus materia, et omnino dissimili disparique genere in regionum varietatibus qualitates insunt in terra. maxime autem id sic licet considerare quod qua mons Appenninus regiones Italiae Etruriaeque circa cingit, prope in omnibus locis non desunt fossicia harenaria, trans Appenninum vero quae pars est ad Adriaticum mare, nulla inveniuntur, item Achaia Asia omnino trans mare nec nominantur quidem. igitur non in omnibus locis quibus effervent aquae calidae crebri fontes, eaedem opportunitates possunt similiter concurrere, sed omnia uti natura rerum constituit, non ad voluptatem hominum sed ut fortuito disparata procreantur.

5. The same kinds of soil and stone do not occur in every region. Some soils are earthy, others sandy or gravelly; elsewhere there are sand and soft tuff. Across different regions the earth has unlike and diverse qualities. This is especially evident where the Apennines enclose the regions of Italy and Etruria: sand pits are found almost everywhere on that side, while on the Adriatic side none are found; nor are they mentioned in Achaia, Asia and the lands across the sea. The same favorable conditions therefore do not necessarily coincide wherever hot springs abound. Nature produces things in diverse ways, as circumstance determines, rather than to suit human wishes.

then, why, if Etruria also has frequent hot springs, a powder does not likewise arise there which, for the same reason, hardens underwater. It is appropriate, therefore, to explain the cause as it seems to me. Not all places and regions produce the same kinds of soil or the same stones; some are earthy, others gravelly, others tuff, others sandy; and, in short, the qualities of the soil are as diverse and dissimilar according to the region as the climate is diverse.

6. ergo quibus locis non sunt terrosi montes sed genere materiae, est autem materiae potestas mollior quam tofus, solidior quam terra ignis vis per eius venas egrediens adurit eam. quod est molle et tenerum exurit, quod autem asperum relinquit. quo penitus ab imo vehementia vaporis adusto, nonnullis locis procreatur id genus harenae, quod dicitur carbunculus itaque uti Campania exusta terra cinis, sic in Etruria excocta materia efficitur carbunculus. utraque

autem sunt egregia in structuris, sed alia in terrenis aedificiis alia etiam in maritimis molibus habent virtutem..

6. Where there are no earthy mountains but soft tuff, fire issuing through its veins burns away the softer parts and leaves the harder residue. Thus, just as burned earth in Campania becomes volcanic ash, burned tuff in Etruria becomes carbunculus sand. Both are excellent in masonry, but one works in buildings on land while the other also serves in structures built in the sea. The material involved is softer than tuff but more solid than earth; when thoroughly burned by subterranean heat, it produces in some places the kind of sand called carbunculus.

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Editorial note. — Chapter 6 is the most celebrated passage on Roman concrete. Vitruvius describes the powder (pulvis) of the country round Baiae and the slopes of Vesuvius — pozzolana, a volcanic ash — which, mixed with lime and rubble, sets into a mass so hard that it withstands not only the weather but the waves of the sea, hardening even under water. He accounts for its action by the latent fire, sulphur and alum of the volcanic ground. This hydraulic mortar (with the pulvis Puteolanus of 5.12) is the technical foundation of the great vaulted and maritime architecture of imperial Rome, and modern chemistry has confirmed the reactive volcanic silica that he intuited. Cf. Pliny, Naturalis historia 35.166, and the Glossarium, s.v. pulvis Puteolanus.

Comparative critical apparatus — II.6. Pulvis denotes the Campanian volcanic material subsequently called pozzolana. Vitruvius states that it can acquire solidity under water when mixed with lime and caementa; his ancient causal explanation is kept separate from contemporary mineralogy.

Comparative apparatus — II.6. “Est etiam genus pulveris quod efficit naturaliter res admirandas” introduces the volcanic material of the region of

Baiae and Vesuvius. Its mixture with lime and caementum, capable of hardening under water according to Vitruvius, is retained as a technical observation; "pozzolana" is used in the commentary as a historical or modern identification, not as an automatic replacement for pulvis.

Historical and geological note — Pulvis. The text connects the material's properties with subterranean heat, tuff, earth, vapor and ancient fires in the Vesuvian area. This aetiology must be separated from the modern explanation of hydraulic reactions in volcanic materials. Κατακεκαυμένη is retained as the Greek place-name or adjective for the "burnt" region.

Chapter 7

1. *De calce et harena quibus varietatibus sint et quas habeant virtutes dixi. sequitur ordo de lapidicinis explicare, de quibus et quadrata saxa et caementorum ad aedificia eximuntur copiae et comparantur. haec autem inveniuntur esse disparibus et dissimilibus virtutibus. sunt enim aliae molles, uti sunt circa urbem Rubrae Pallenses Fidenates Albanae, aliae temperatae, uti Tiburtinae Amiterninae Soractinae et quae sunt his generibus, nonnullae durae, uti siliceae. sunt etiam alia genera plura, uti in Campania rubrûm et nigrûm tofûm, in Umbria et Piceno et in Venetia albus, quod etiam serra dentata uti lignum secatur.*

1. I have discussed the varieties of lime and sand and their properties. Next come the stone quarries from which ashlar and rubble for buildings are cut and prepared. Their properties differ. Some stones are soft, such as the red stones near Rome and those of Pallene, Fidenae and the Alban district; others are intermediate, such as those of Tibur, Amiternum and Soracte; others, such as hard silex, are very hard. There are many further kinds, including red and black tuffs in Campania, and stones in Umbria, Picenum and Venetia, some of which can be cut with a toothed saw like timber.

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2. sed haec omnia quae mollia sunt hanc habent utilitatem quod ex his saxa cum sunt exempta in opere faciliter tractantur. et si sunt in locis tectis, sustineant laborem, si autem in apertis et patentibus, gelicidiis et pruina congesta friantur et dissolvuntur. item secundum oram maritimam ab salsugine exesa diffluunt neque perferunt aestus. Tiburtina vero et quae eodem genere sunt omnia sufferunt et ab oneribus et a tempestatibus iniurias, sed ab igni non possunt esse tuta simulque sunt ab eo tacta dissiliunt et dissipantur, ideo quod temperatura naturali parvo sunt umore itemque non multum habent terreni sed aeris

plurimum et ignis. igitur cum et umor et terrenum in his minus inest, tum etiam ignis, tactu et vi vaporis ex his aere fugato, penitus insequens interveniorum vacuitates occupans fervescit et efficit a suis ardentia corporibus ⟨carbonibus⟩ similia.

2. Soft stones are easily worked when freshly quarried. Under cover they serve well, but in exposed places frost and hoarfrost cause them to crumble and dissolve. Near the sea, salt also eats into them, and they do not withstand intense heat. Travertine and stones of the same kind withstand both loads and weather, but are unsafe in fire: once heated they crack and disintegrate. Their natural composition contains little moisture or earth and much air and fire. With moisture and earth scarce, heat expels the air, fills the intervening voids, and makes the stone itself burn like the bodies already on fire.

Soft stones are easily worked when freshly quarried. Under cover they serve well, but in exposed places frost and hoarfrost cause them to crumble and dissolve. Near the sea, salt also eats into them, and they do not withstand intense heat. Travertine and stones of the same kind withstand both loads and weather, but are unsafe in fire: once heated they crack and disintegrate. Their natural composition contains little moisture or earth and much air and fire. With moisture and earth scarce, heat expels the air, fills the intervening voids, and makes the stone itself burn like the bodies already on fire.

3. sunt vero item lapidicinae complures in finibus Tarquiniensium, quae dicuntur Anicianae, colore quemadmodum Albanae, quarum officinae maxime sunt circa lacum Vulsiniensem, item praefectura Statonensi. haec autem habent infinitas virtutes. neque enim his gelicidiorum tempestas neque ignis tactus potest nocere, sed est firma et ad vetustatem ideo permanens quod parum habet e naturae mixtione aeris et ignis, umoris autem temperate plurimumque terreni. ita spissis comparationibus solidata neque ab tempestatibus neque ab ignis vehementia nocetur.

3. There are also many stones in the territory of the Tarquinians, which are called Anician, in color like the Alban, whose quarries are principally around Lake Volsini, as well as in the prefecture of Staton. These have infinite virtues. For neither the storm of frost nor the touch of fire can harm them, but they are strong and durable because they have little of the natural mixture of air and fire,

but a moderate and very earthy moisture. Thus, solidified by thick layers, they are not harmed by the violence of storms or fire.

There are also numerous quarries in the territory of Tarquinia, called Anician quarries, the color of the Albanos, whose main exploitation is around Lake Volsinensis and in the Statonian Prefecture. This stone has countless virtues: neither frost nor fire damages it, but it remains firm and lasts a long time, because its composition contains little air and fire, moderate moisture, and a high amount of earth. Thus, with its dense and compact texture, neither ice nor contact with fire deteriorates it.

4. id autem maxime iudicare licet e monumentis quae sunt circa municipium Ferenti ex his facta lapidicinis. namque habent et statuas amplas factas egregie et minora sigilla floresque et acanthos eleganter scalptos. quae cum sint vetusta, sic apparent recentia uti si sint modo facta. non minus etiam fabri aerarii de his lapidicinis in aeris flatura formis comparatis habent ex his ad aes fundendum maximas utilitates. quae si prope urbem essent, dignum esset ut ex his officinis omnia opera perficerentur.

4. This may be judged especially from monuments made of these stones around Ferentium. They include large statues excellently executed, smaller figures, flowers and acanthus leaves skilfully carved. Although old, they appear as fresh as if made recently. Bronze-workers also find the stones very useful when prepared as molds for casting bronze. If these quarries were near Rome, it would be appropriate to use their stone for all building works.

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5. cum ergo propter propinquitatem necessitas cogat ex Rubris lapidicinis et Pallensibus et quae sunt urbi proximae copiis uti, si qui voluerit sine vitiis perficere, ita erit praeparandum. cum aedificandum fuerit, ante biennium ea saxa non hieme sed aestate eximantur, et iacentia permaneant in locis patentibus. quae autem eo biennio a tempestatibus tacta laesa fuerint, ea in fundamenta coiciantur. cetera quae non erunt vitiata, ab natura rerum probata durare

poterunt supra terram aedificata. nec solum ea in quadratis lapidibus sunt observanda sed etiam in caementiciis structuris.

5. Since, therefore, necessity compels us to use the resources of Rubri and Pallensi, and those which are near the city, if anyone wishes to complete it without defects, this is how it should be prepared. When it is to be built, let those stones be taken out two years before, not in winter but in summer, and let them remain lying in open places. But those which have been damaged by storms during those two years, let them be cast into the foundations. The rest, which will not be defective, will be able to last built above ground, as proven by the nature of things. And not only should these be observed in square stones, but also in rubble masonry.

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Comparative apparatus — II.7. The lapidicinae produce quadrata saxa and caementa with different virtutes. Vitruvius distinguishes molles, temperatae and durae stones, discussing their response to frost, weather and fire. Rubrae, Pallenses, Fidenates, Albanae, Tiburtinae, Amiterninae and Soractinae are retained as an ancient technical and geographical classification.

Conservation note — Stone. The recommendation to quarry certain stones in advance and expose them so that deteriorating pieces can be rejected is explained as an empirical selection procedure. The edition does not convert molles/temperatae/durae into a modern petrographic classification without mineralogical analysis.

Comparative critical apparatus — II.7. The chapter on quarries is compared with Rose, Krohn and the Budé edition of Book II. The ancient nomenclature of lapidicinae and regional materials is retained without forcing modern petrographic identifications where the text does not support them. The contrast

between molles and durae stones is explained in terms of workability, exposure, frost, salinity and fire; claims concerning Ferento are retained as Vitruvius's observations rather than modern durability tests.

Technical and archaeological note — II.7. The procedure of quarrying certain ashlar blocks two years before building and leaving them exposed serves as selection by weathering: deteriorating pieces are assigned to sheltered locations, and resistant ones to exposed positions. The note distinguishes the ancient prescription from any modern testing protocol.

Chapter 8

1. *Structurarum genera sunt haec, reticulatum quo nunc omnes utuntur, et antiquum quod incertum dicitur. ex his venustius est reticulatum, sed ad rimas faciendas ideo paratum quod in omnes partes dissoluta habet cubilia et coagmenta. incerta vero caementa alia super alia sedentia inter seque imbricata non speciosam sed firmiorem quam reticulata praestant structuram.*

Archaeological note — II.8, masonry bonds. Vitruvius contrasts two arrangements of wall facing: reticulatum, customary in his time, and the older incertum. He considers the former more elegant (venustius), though more prone to cracking because of the arrangement of beds and joints; the latter he judges less handsome but stronger. Vitruvian terminology has decisively influenced modern archaeological nomenclature, although that classification should not be projected without qualification on to every phase of Roman construction. Opus incertum uses irregular pieces visible in the facing; opus reticulatum arranges cubilia with their faces forming a diagonal network. Later or combined techniques, such as brick facings and so-called opus mixtum, belong to developments beyond the passage's immediate description. Vitruvius subsequently compares these fabrics with Greek procedures, including emplekton and the use of transverse elements (διάτονοι).

1. There are two kinds of masonry facing: the reticulatum now commonly used, and the older kind called incertum. The reticulatum is more attractive but is liable to crack because its bedding surfaces and joints are discontinuous in every direction. In the incertum, irregular rubble stones rest upon and overlap one another, producing masonry that is less handsome but stronger than the reticulatum.

The types of masonry (structurae) are these: the reticulated (reticulatum), which everyone uses now, and the ancient one, which is called incertum. Of these, the most elegant is the reticulated, but it is prone to cracking because its beds and joints settle in all directions. In contrast, the uncertain, with its stones (camenta) interlocked course upon course, although less showy, is more solid than the reticulated.

2. utraque autem ex minutissimis sunt instruenda, uti materia ex calce et harena crebriter parietes satiati diutius contineantur. molli enim et rara potestate cum sint, exsiccant sugendo e materia sucum. cum autem superarit et abundarit copia

calcis et harenae, paries plus habens umoris non cito fiet evanidus, sed ab his continetur. simul autem umida potestas e materia per caementorum raritatem fuerit exsucta calxque ab harena discedat et dissolvatur, item caementa non possunt cum his cohaerere, sed in vetustatem parietes efficiunt ruinosos.

2. Both kinds should be built with very small stones, so that abundant mortar of lime and sand saturates the walls and holds them together longer. Soft, porous stones dry out by drawing moisture from the mortar. If lime and sand are plentiful, the wall retains more moisture and does not quickly weaken. But once the pores of the stones have absorbed the mortar's moisture, the lime separates from the sand and disintegrates; the rubble can no longer adhere, and the walls become ruinous with age.

Both are to be built with small stones, so that the walls, saturated by the frequent joints of lime and sand, may hold more firmly. For since the stones are rough and porous by nature, as they dry they absorb the water of the mortar and consume it to excess; but when there is an abundance of lime and sand, the wall, having more mortar, does not soon lose its cohesion but keeps the stones bound together.

3. id autem licet animadvertere etiam de nonnullis monumentis, quae circa urbem facta sunt e marmore seu lapidibus quadratis intrinsecusque medio calcata structuris, vetustate evanida facta materia caementorumque exsucta raritate, proruunt et coagmentorum ab ruina dissolutis iuncturis dissipantur.

3. This can be observed in monuments near Rome whose outer faces were made of marble or ashlar, with a rubble core packed between them. As the mortar weakens with age and the porous rubble dries it out, the monuments collapse; the joints of their facing stones loosen and the work breaks apart.

This may also be observed in certain monuments built around the City in marble or dressed stone—that is, with the interior filled with rubble masonry: in time the mortar, its strength lost through age, disintegrates, and the monuments collapse as their bonding gives way.

4. quodsi qui noluerit in id vitium incidere, medio cavo servato secundum orthostatas, intrinsecus ex rubro saxo quadrato aut ex testa aut ex silicibus ordinariis struat bipedales parietes, et cum his ansis ferreis et plumbo frontes vinctae sint. ita enim non acervatim sed ordine structum opus poterit esse sine vitio

sempiternum, quod cubilia et coagmenta eorum inter se sedentia et iuncturis alligata non protrudent opus neque orthostatas inter se religatos labi patiuntur.

4. To avoid this defect, leave the space behind the facing stones and build inner walls two feet thick of squared red stone, fired brick or ordinary hard stone. Tie the inner work to the outer faces with iron clamps secured with lead. Built in regular courses rather than loose heaps, the work can remain sound: the beds and bonded joints keep the masonry from thrusting out, while the connected facing stones prevent it from slipping.[145]

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5. Itaque non est contemnenda Graecorum structura. non enim utuntur e molli caemento structura polita, sed cum discesserunt a quadrato, ponunt de silice seu lapide duro ordinaria, et ita uti latericia struentes alligant eorum alternis coriis coagmenta, et sic maxime ad aeternitatem firmas perficiunt virtutes. haec autem duobus generibus struuntur. ex his unum isodomum, alterum pseudisodomum appellatur.

5. Greek masonry should therefore not be disparaged. The Greeks do not make a carefully finished facing of soft rubble: when not using ashlar, they build with ordinary hard stone, laying it like brick and bonding the joints in alternating courses. They thus achieve lasting strength. They build this masonry in two forms, one called isodomon and the other pseudisodomon.

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145 orthostata, -ae] From Greek ὀρθοστάτης, "an upright element". In building terminology it denotes a block or slab set vertically in the lower part of a wall facing. The note retains the technical term and avoids equating it without qualification with a modern "post".

alternating courses. They thus achieve lasting strength. They build this masonry in two forms, one called isodomon and the other pseudisodomon.[146]

6. isodomum dicitur cum omnia coria aequa crassitudine fuerint structa, pseudisodomum cum inpares et inaequales ordines coriorum diriguntur. ea utraque sunt ideo firma, primum quod ipsa caementa sunt spissa et solida proprietate neque de materia possunt exsugere liquorem sed conservant eam in suo umore ad summam vetustatem, ipsaque eorum cubilia primum plana et librata posita non patiuntur ruere materiam, sed perpetua parietum crassitudine religata continent ad summam vetustatem.

6. Masonry is called isodomon when every course has the same height, and pseudisodomon when the courses differ in height. Both are strong because their dense, solid stones do not draw liquid from the mortar but preserve its moisture. Their beds, laid flat and level, prevent the mortar from slipping, while the continuous thickness and bonding of the walls hold the work securely together.

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7. altera est quam ἔμπλεκτον appellant, qua etiam nostri rustici utuntur. quorum frontes poliuntur, reliqua ita uti sunt nata cum materia conlocata alternis alligant coagmentis. sed nostri celeritati studentes, erecta conlocantes frontibus serviunt et in medio farciunt fractis separatim cum materia caementis. ita tres suscitantur in ea structura crustae, duae frontium et una media farturae. Graeci vero non ita, sed plana conlocantes et longitudines eorum alternis in crassitudinem instruentes, non media farciunt sed e suis frontatis perpetuam et unam crassitudinem parietum consolidant. praeterea interponunt singulos crassitudine perpetua utraque parte frontatos, quos διάτονοι appellant, qui maxime religando confirmant parietum soliditatem.

146 isodomum / pseudoisodomum] From Greek ἰσόδομον / ψευδισόδομον. In opus isodomum the courses have a regular height; in pseudoisodomum courses of different heights alternate. The distinction concerns masonry bond and the modulation of courses, not the nature of the material.

7. Another kind, called emplekton, is also used by our country builders. Its faces are dressed, while the stones within are left in their natural state and bonded with mortar in alternating courses. Our builders, pursuing speed, set the facings upright and fill the middle separately with rubble and mortar, producing three distinct layers: two outer faces and an inner filling. The Greeks instead lay their stones flat and alternate their lengths through the thickness. They do not merely fill the middle but make one continuous thickness from face to face. They also insert stones that run through the full thickness and project at both faces, called diatonoi; these ties greatly strengthen the walls.

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8. itaque si qui voluerit ex his commentariis animadvertere et eligere genus structurae, perpetuitatis poterit rationem habere. non enim quae sunt e molli caemento subtili facie venustatis, non eae possunt esse in vetustate non ruinosae. itaque cum arbitri communium parietum sumuntur, non aestimant eos quanti facti fuerint, sed cum ex tabulis inveniunt eorum locationes, pretia praeteritorum annorum singulorum deducunt octogesimas et ita ex reliqua summa ⟨pro rata⟩ parte reddi pro his parietibus sententiam pronuntiant eos non posse plus quam annos LXXX durare.

8. Anyone wishing to examine these observations and select a kind of masonry can therefore take account of its durability. Walls built from soft rubble, however finely finished, cannot remain free from decay as they age. Accordingly, when valuers assess party walls, they do not simply allow their original cost: after establishing the date of the contract from the records, they deduct one-eightieth

147 In architecture and construction, masonry bond (Spanish aparejo, related to Latin apparare, "to prepare"; opus in descriptions of Roman building) is the form, structure or constructive arrangement of a wall.

of the price for each year that has elapsed and award the appropriate proportion of the remainder. Their assessment assumes that such walls cannot endure for more than eighty years.

Therefore, if someone wishes, using these comments, to advise on and choose the type of construction, they can ensure its longevity. For those built of soft stone and of a fine appearance cannot last long; and so, when appraisals are made of party walls, they are not assigned their value as new construction, but rather, deducting from their original price one-eightieth for each year that has passed, it is determined that the remainder of that sum should be paid, since it is estimated that they will not last more than eighty years.

9. De latericiis vero dummodo ad perpendiculum sint stantes nihil deducitur, sed quanti fuerint olim facti, tanti esse semper aestimantur. itaque nonnullis civitatibus et publica opera et privatas domos etiam regias e latere structas licet videre, et primum Athenis murum qui spectat ad Hymettum montem et Pentelensem, item Patris in aede Iovis et Herculis latericias cellas, cum circa lapidea in aede epistylia sint et columnae, in Italia Arretio vetustum egregie factum murum, Trallibus domus regibus Attalicis facta quae ad habitandum semper datur ei qui civitatis gerit sacerdotium. item Lacedaemone e quibusdam parietibus etiam picturae excisae intersectis lateribus inclusae sunt in ligneis formis et in comitium ad ornatum aedilitatis Varronis et Murenae fuerunt adlatae.

9. In brick walls, provided they remain plumb, no deduction is made: they are always valued at their original cost. In some cities public works, private houses and royal palaces can therefore be seen built of brick. Examples include the Athenian wall facing Hymettus and Pentelicus; the brick cellae in the temples of Jupiter and Hercules at Patras, with stone columns and architraves around them; the ancient, excellently built wall at Arretium in Italy; and the house at Tralles built for the Attalid kings, assigned as a residence to whoever holds the city's priesthood. At Sparta, paintings were cut out of brick walls, enclosed in wooden frames and brought to the Comitium to adorn the aedileship of Varro and Murena.

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10. Croesi domus, quam Sardiani civibus ad requiescendum aetatis otio, seniorum collegio gerusiam dedicaverunt. item Halicarnasso potentissimi regis Mausoli domus cum Proconnensio marmore omnia haberet ornata, parietes habet latere structos, qui ad hoc tempus egregiam praestant firmitatem ita tectoriis operibus expoliti uti vitri perluciditatem videantur habere. neque is rex ab inopia id fecit. infinitis enim vectigalibus erat fartus, quod imperabat Cariae toti.

10. The house of Croesus, which the people of Sardis assigned to the citizens of their city to rest in the leisure of their age, to the college of elders. Likewise, the house of the most powerful king Mausolus at Halicarnassus, although it was adorned with Proconnesian marble, has walls built of brick, which for this time show excellent strength, so polished by the works of painting that they seem to have the translucency of glass. Nor did that king do this from want. For he was enriched by immense revenues, since he ruled all Caria.

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11. acumen autem eius et sollertiam ad aedificia paranda sic licet considerare. cum esset enim natus Mylasis et animadvertisset Halicarnasso locum naturaliter

148Mausolus, son of Hecatomnus, was a ruler of Caria under Achaemenid authority. His building activity and the monument at Halicarnassus belong to the historical context of the architectural examples discussed here. Details of his youth and personal contacts require independent evidence.

esse munitum idoneum portum emporiumque utile, ibi sibi domum constituit. is autem locus est theatri curvaturae similis. itaque in imo secundum portum forum est constitutum. per mediam autem altitudinis curvaturam praecinctionemque platea ampla latitudine facta, in qua media Mausoleum ita egregiis operibus est factum ut in septem spectaculis nominetur. in summa arce media Martis fanum habens statuam colossicam acrolithon nobili manu Leocharis factam. hanc autem statuam alii Leocharis alii Timothei putant esse. in cornu autem summo dextro Veneris et Mercurii fanum ad ipsum Salmacidis fontem.

11. His judgment and skill in planning buildings may be understood as follows. Born at Mylasa, he observed that Halicarnassus offered natural defenses, a suitable trading center and a useful harbour, and established his residence there. The site curves like a theater. At its lowest part, beside the harbour, he laid out the forum; halfway up the curving slope he made a broad street, with the Mausoleum at its center, a work of such distinction that it was numbered among the Seven Wonders. At the center of the summit stood the temple of Mars with a colossal acrolithic statue, attributed by some to Leochares and by others to Timotheus. On the right-hand height stood the temple of Venus and Mercury, near the spring of Salmacis.

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149 Leochares /liːˈɒkəriːz/ (Greek: Λεοχάρης or Λεωχάρης) was an ancient Greek sculptor from Athens, who lived in the 4th century BC. Works: Leochares worked on the construction of the Mausoleum of Mausolus at Halicarnassus, one of the "Seven Wonders of the Ancient World." The Diana of Versailles is a Roman copy of his original (c. 325 BC). He is also believed to be the creator of the famous Apollo Belvedere, of which a Roman copy is currently kept in Vatican City. In Greek mythology, Salmacis was a Phrygian nymph who loved Hermaphroditus.

12. is autem falsa opinione putatur venerio morbo inplicare eos qui ex eo biberint. sed haec opinio quare per orbem terrae falso rumore sit pervagata non pigebit exponere. non enim quod dicitur molles et inpudicos ex ea aqua fieri, id potest esse, sed est eius fontis potestas perlucida saporque egregius. cum autem Melas et Areuanias ab Argis et Troezene coloniam communem eo loci deduxerunt, barbaros Caras et Lelegas eiecerunt. Hi autem ad montes fugati inter se congregantes discurrebant et ibi latrocinia facientes crudeliter eos vastabant. postea de colonis unus ad eum fontem propter bonitatem aquae quaestus causa tabernam omnibus copiis instruxit eamque exercendo eos barbaros allectabat. ita singillatim decurrentes et ad coetus convenientes e duro feroque more commutati in Graecorum consuetudinem et suavitatem sua voluntate reducebantur. ergo ea aqua non inpudico morbi vitio sed humanitatis dulcedine mollitis animis barbarorum eam famam est adepta.

12. It is falsely believed that this spring causes an effeminate condition in those who drink from it. I shall explain how that mistaken report spread. Its water cannot produce the softness and immodesty alleged: it is clear and excellent to taste. When Melas and Arevanias brought a joint colony from Argos and Troezen, they expelled the local Carians and Leleges. Driven into the mountains, these people gathered in bands, raided the settlers and devastated the district. One colonist later built a tavern beside the spring, attracted by the water's quality, and by conducting his business drew the local people to it. Coming first singly and then in groups, they gradually exchanged their harsh customs for the gentler ways of the Greeks. The water acquired its reputation not by causing a bodily disease but by softening their dispositions through the civilising appeal of human society.

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customs for the gentler ways of the Greeks. The water acquired its reputation not by causing a bodily disease but by softening their dispositions through the civilising appeal of human society.

13. Relinquitur nunc quoniam ad explicationem moenium eorum sum invectus, ut tota uti sunt definiam. quemadmodum enim in dextra parte fanum est Veneris et fons supra scriptus, ita in sinistro cornu regia domus, quam rex Mausolus ad suam rationem conlocavit. conspicitur enim ex ea ad dextram partem forum et portus moeniumque tota finitio, sub sinistram secretus sub moenibus latens portus ita ut nemo possit quid in eo geratur aspicere nec scire,

13. Since I have been led to describe the city, it remains to set out its overall arrangement. Just as the temple of Venus and the spring described above stand on the right, the royal palace stands on the left. Mausolus placed it to serve his own purposes: to the right it commands a view of the forum, the harbour and the whole circuit of the walls; to the left lies a harbour concealed beneath the walls, where no one else could see or know what was being done.

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14. at rex ipse de sua domo remigibus et militibus sine ullo sciente quae opus essent imperaret. itaque post mortem Mausoli Artemisia uxore eius regnante Rhodii indignantes mulierem imperare civitatibus Cariae totius, armata classe profecti sunt uti id regnum occuparent. tum Artemisiae cum esset id renuntiatum, in eo portu abstrusam classem celatis remigibus et epibatis comparatis, reliquos autem cives in muro esse iussit. cum autem Rhodii ornata classe in portum maiorem exposuissent, plausum iussit ab muro his dare pollicerique se oppidum tradituros. qui cum penetravissent intra murum relictis navibus inanibus, Artemisia repente fossa facta in pelagum eduxit classem ex portu minore et ita invecta est in maiorem. expositis autem militibus classem Rhodiorum inanem abduxit in altum. ita Rhodii non habentes quo se reciperent, in medio conclusi in ipso foro sunt trucidati.

14. From his own house the king could direct the rowers and soldiers without anyone else knowing what was required. After Mausolus's death, when his wife Artemisia ruled, the Rhodians, indignant that a woman should govern all the cities of Caria, sailed with an armed fleet to seize the kingdom. Informed of their approach, Artemisia ordered her own fleet concealed in the smaller harbour, with rowers and marines ready, while the other citizens occupied the walls. When the Rhodians entered the larger harbour, she had the citizens salute them from the walls and promise to surrender the town. The Rhodians left their ships empty and entered within the walls. Artemisia then brought her fleet out of the smaller harbour through the opening to the sea and round into the larger harbour. Landing her soldiers, she seized the empty Rhodian ships and took them out to sea. With no route of retreat, the Rhodians were surrounded and killed in the forum.

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15. ita Artemisia in navibus Rhodiorum suis militibus et remigibus inpositis Rhodum est profecta. Rhodii autem cum prospexissent suas naves laureatas venire, opinantes cives victores reverti hostes receperunt. tum Artemisia Rhodo capta principibus occisis tropaeum in urbe Rhodo suae victoriae constituit aeneasque duas statuas fecit unam Rhodiorum civitatis alteram suae imaginis. eam ita figuravit Rhodiorum civitati stigmata inponentem. id autem postea ⟨tollere⟩ Rhodii religione inpediti quod nefas est tropaea dedicata removeri, circa

eum locum aedificium struxerunt et id electa Graia statione texerunt ne qui posset aspicere, et id ἄβατον vocitari iusserunt.

15. Artemisia then sailed to Rhodes in the Rhodians' ships with her own soldiers and rowers aboard. Seeing their ships arrive crowned with laurel, the Rhodians thought their victorious citizens were returning and admitted the enemy. After taking Rhodes and killing its leaders, Artemisia erected a trophy of her victory and two bronze statues: one representing the city of Rhodes and the other herself. She represented herself branding the Rhodian city. The Rhodians later refrained from removing the monument for religious reasons, since a dedicated trophy could not lawfully be taken away. They built an enclosure around the place and screened it so that no one could look upon it, ordering it to be called the abaton (ἄβατον), the inaccessible precinct.

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16. Cum ergo tam magna potentia reges non contempserint latericiorum parietum structuras, quibus ex vectigalibus et praeda saepius licitum fuerat non modo caementicio aut quadrato saxo sed etiam marmoreo habere, non puto oportere inprobare quae sunt e latericia structura facta aedificia, dummodo recte sint tecta. sed id genus quid ita populo Romano in urbe fieri non oporteat exponam, quaeque sunt eius rei causae et rationes non praetermittam.

16. Since powerful kings did not disdain brick walls, although their revenues and spoils allowed them to use rubble, ashlar or even marble, I do not think brick buildings should be rejected, provided they are properly roofed. I shall explain why the Roman people do not use such walls in the city, and shall set out the causes and reasons.

Since, then, kings of such great power did not disdain brick walls—kings who, from their revenues and spoils, lacked neither money nor labor—I do not think that well-made brick constructions should be despised, provided they are suitably roofed.

17. leges publicae non patiuntur maiores crassitudines quam sesquipedales constitui loco communi. ceteri autem parietes, ne spatia angustiora fierent, eadem crassitudine conlocantur. latericii vero nisi diplinthii aut triplinthii fuerint, sesquipedali crassitudine non possunt plus quam unam sustinere contignationem. in ea autem maiestate urbis et civium infinita frequentia innumerabiles habitationes opus est explicare. ergo cum recipere non possint areae planatae tantam multitudinem ad habitandum in urbe, ad auxilium altitudinis aedificiorum res ipsa coegit devenire. itaque pilis lapideis structuris testaceis parietibus caementiciis altitudines extructae contignationibus crebris coaxatae cenaculorum ad summas utilitates perficiunt despectationes. ergo moenibus e contignationibus areis alto spatio multiplicatis populus Romanus egregias habet sine inpeditione habitationes.

17. Public regulations do not allow party walls thicker than a foot and a half, and other walls are built to the same thickness to avoid narrowing the available space. Yet brick walls of that thickness cannot support more than one story unless they are two or three bricks thick. The greatness of Rome and the immense number of its citizens require countless dwellings. Since the ground area cannot accommodate so many people, necessity has forced recourse to building upwards. Stone piers, fired-brick masonry and rubble walls, raised high and joined by frequent timber floors, provide useful upper-story dwellings. By multiplying floor space vertically, the Roman people obtain ample housing without obstructing the ground.

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multiplying floor space vertically, the Roman people obtain ample housing without obstructing the ground.

18. Quoniam ergo explicata ratio est quid ita in urbe propter necessitatem angustiarum non patiuntur esse latericios parietes, cum extra urbem opus erit his uti, ⟨ut sint⟩ sine vitiis ad vetustatem sic erit faciendum. summis parietibus structura testacea sub tegula subiciatur altitudine circiter sesquipedali, habeatque proiecturas coronarum. ita vitari poterunt quae solent in his fieri vitia. cum enim in tecto tegulae fuerint fractae aut a ventis deiectae, qua possint ex imbribus aquae perpluere, non patietur lorica testacea laedi laterem, sed proiectura coronarum reiciet extra perpendiculum stillas et ea ratione servaverit integras parietum latericiorum structuras.

18. Having explained why restricted sites prevent the use of brick walls in Rome, I shall describe how to make them durable where they are used outside the city. At the tops of the walls, beneath the roof tiles, build a fired-brick course about a foot and a half high, with projecting cornices. This prevents the usual damage: if roof tiles break or are displaced by wind and rainwater enters, the fired-brick protection prevents it from harming the unfired bricks. The projecting cornice throws the drops beyond the face of the wall and preserves the brick masonry intact.

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19. De ipsa autem testa, si sit optima seu vitiosa ad structuram, statim nemo potest iudicare, quod in tempestatibus et aestate in tecto cum est conlocata, tunc, si est firma, probatur; namque quae non fuerit ex creta bona aut parum erit cocta, ibi se ostendet esse vitiosam gelicidiis et pruina tacta. Ergo quae non in tectis poterit pati laborem, ea non potest in structura oneri ferendo esse firma. Quare maxime ex veteribus tegulis tecta ⟨et ex vetere testa⟩ structi parietes firmitatem poterunt habere.

19. No one can immediately judge whether a fired brick is good or bad for masonry. Its strength is tested by exposure to weather and age when used on a roof. If it is made from unsuitable clay or insufficiently fired, frost reveals its weakness. A material that cannot endure service on a roof cannot be strong enough to bear a load in masonry. Walls made of old, tested roof tiles will therefore be especially strong.

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20. craticii vero velim quidem ne inventi essent. quantum enim celeritate et loci laxamento prosunt, tanto maiori et communi sunt calamitati, quod ad incendia uti faces sunt parati. itaque satius esse videtur inpensa testaceorum in sumptu quam compendio craticiorum esse in periculo. etiamque in tectoriis operibus rimas hi faciunt arrectariorum et transversariorum dispositione. cum enim linuntur, recipientes umorem turgescunt, deinde siccescendo contrahuntur et ita extenuati disrumpunt tectoriorum soliditatem. sed quoniam nonnullos celeritas aut inopia aut in pendenti loco dissaeptio cogit, sic erit faciundum. solum substruatur [aliae], ut sit intactum ab rudere et pavimento. obruta enim in his cum sunt, vetustate marcida fiunt, deinde subsidentia proclinantur et disrumpunt speciem tectoriorum. De parietibus et apparitione generatim materiae eorum, quibus sint virtutibus et vitiis quemadmodum potui exposui, de contignationibus autem et copiis earum, quibus comparentur ut ad vetustatem non sint infirmae, uti natura rerum monstrat explicabo.

20. I wish timber-framed partition walls had never been invented. Their speed of construction and saving of space are outweighed by the greater and more general danger they create, for they are ready-made torches for a fire. It is better to incur the expense of fired-brick walls than to save money through timber framing and live in danger. Such framing also cracks the plaster along the upright and cross-members: when plastered, the timbers absorb moisture and swell, then shrink as they dry and break the plaster's cohesion. Where speed, lack of resources or the need for a partition on an upper floor makes timber framing

necessary, its base should be built up so that the timbers do not touch the rubble bedding or floor pavement. If buried in those layers, they decay with age, settle, lean and break the plaster surface. I have explained wall construction, its materials and their strengths and weaknesses as well as I can. I shall now discuss timber floors and the supplies used for them, explaining the natural properties needed for durability.

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I have explained, as best I could, the matter of walls and the general diversity of their materials, with their virtues and defects. I will now discuss timbers, explaining how they should be stockpiled so that they do not present defects in the construction.

Editorial note. — Chapter 8 is the principal ancient source on wall construction. Vitruvius contrasts the fashionable reticulate facing (opus reticulatum), elegant but prone to cracking, with the older random facing (opus incertum), less handsome but sounder; both, set in lime-and-sand mortar over a rubble core, are weakened if the core is coarse. He commends Greek practice: the squared, mortarless ashlar laid as isodomon (courses of equal height) or pseudisodomon (unequal courses), and the emplekton (ἔμπλεκτον), faced on both sides with bonding-stones (diatoni) tying the two leaves together — the weakness of the Roman two-leaf wall being precisely the want of such ties. The terms

reticulatum, incertum, isodomon, pseudisodomon and emplekton are retained, with glosses, in the Glossarium.

Comparative critical apparatus — II.8. The terminological core requires retaining opus reticulatum, opus incertum, isodomum, pseudisodomum and ἔμπλεκτον as technical terms. In II.8.5–7 the critical text also transmits διατόνους for the pieces that pass through and bond the wall's thickness. Isodomum denotes courses of equal height; pseudisodomum, unequal courses. Greek ἔμπλεκτον is explained by the relation between facings, lengthwise pieces and bonding through the thickness, not simply as "infill".

Architectural note — II.8. Vitruvius compares masonry systems with simultaneous attention to appearance, joints, beds, moisture absorption, transverse bonding and speed of execution. A constructional reading must preserve the distinctions between facing, core, cubilia, coagmenta and diatonoi; reducing everything to modern categories of "masonry" or "concrete" erases essential distinctions in the passage.

Textual and constructional note — II.8. The description of bonds distinguishes transmitted terminology from graphic reconstruction. Ἰσόδομον, ψευδισόδομον, ἔμπλεκτον and διάτονοι are retained as Greek technical terms accompanied by a functional explanation. Equivalence with modern archaeological categories is offered only where secure and is not used to alter the Latin.

Synthesis for architects — II.8. The central problem is not merely the appearance of the facing: Vitruvius considers cubilia, coagmenta, continuity of joints, transverse ties and the behavior of the core. The comparative apparatus avoids equating opus reticulatum and incertum without qualification with any visually similar modern construction.

Chapter 9

1. *Materies caedenda est a primo autumno ad id tempus quod erit antequam flare incipiat favonius. vere enim omnes arbores fiunt praegnantes et omnes suae proprietatis virtutem efferunt in frondem anniversariosque fructus. cum ergo inanes et tumidae temporum necessitate eorum fuerint, vanae fiunt et raritatibus inbecillae, uti etiam corpora muliebria cum conceperint, fetus a partu non iudicantur integra, neque in venalibus ea cum sunt praegnantia praestantur sana, ideo quod in corpore praeseminatio crescens ex omnibus cibi potestatibus detrahit alimentum in se, et quo firmior efficitur ad maturitatem partus, eo minus patitur esse solidum id ipsum ex quo procreatur. itaque edito fetu quod prius in aliud genus incrementi detrahebatur cum disparatione procreationis est liberatum, inanibus et patentibus venis in se recipiens lambendo sucum etiam solidescit et redit in pristinam naturae firmitatem.*

1. Timber should be felled from the beginning of autumn until before Favonius starts to blow. In spring, all trees become, as it were, pregnant and direct their natural strength into foliage and annual fruit. Drained and swollen by the demands of the season, they become porous and weak. The same comparison is made with women's bodies: after conception they are not considered unimpaired until delivery, nor are they warranted as healthy in sales while pregnant, because the growing foetus drew nourishment from the body and weakened the source from which it developed. After delivery, nourishment was no longer diverted into another growing body; the open veins again took up sustenance, restoring solidity and the former natural strength.

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2. eadem ratione autumnali tempore maturitate fructuum flaccescente fronde, ex terra recipientes caudices arborum in se sucum recuperantur et restituuntur in antiquam soliditatem. at vero aeris hiberni vis comprimit et consolidat eas per id ut supra scriptum est tempus. ergo si ea ratione et eo tempore quod est supra scriptum caeditur materies, erit tempestiva.

2. For the same reason, in the autumn season, when the leaves of the fruit ripen and fall, the trees, receiving sap from the earth through their roots, are recovered and restored to their former solidity. But the force of the winter air compresses and consolidates them for the time mentioned above. Therefore, if the material is cut down for that reason and at the time mentioned above, it will be in season.

For the same reason, in autumn, once the fruits have ripened and the foliage withered, the trees, drawing up sap from the earth through their roots, recover and regain their former soundness. They should therefore be felled then, before the west wind (Favonius) stirs the air and the humours spread once more through the branches.

3. caedi autem ita oportet uti incidatur arboris crassitudo ad mediam medullam, et relinquatur, uti per eam exsiccescat stillando sucus. ita qui inest in his inutilis liquor effluens per torulum non patietur emori in eo saniem nec corrumpi materiae aequalitatem. tum autem cum sicca et sine stillis erit arbor, deiciatur et ita erit optima in usu.

3. The tree should first be cut through to the middle of its pith and left standing so that the sap can drain through the cut. The useless liquid within can then flow out rather than decay and damage the timber. When the tree is dry and no longer dripping, it should be felled; it will then be in the best condition for use.

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4. hoc autem ita esse licet animum advertere etiam de arbustis. ea enim cum suo quoque tempore ad imum perforata castrantur, profundunt e medullis quem habent in se superantem et vitiosum per foramina liquorem, et ita siccescendo recipiunt in se diuturnitatem. qui autem non habent ex arboribus exitus umores intra concrescentes putrescunt et efficiunt inanes eas et vitiosas. ergo si stantes et

vivae siccescendo non senescunt, sine dubio cum eae ad materiam deiciuntur, cum ea ratione curatae fuerint, habere poterunt magnas in aedificiis ad vetustatem utilitates.

4. The same can be observed in trees: when pierced at the base in the proper season, they discharge through the openings the excessive, harmful sap in their pith, and drying in this way increases their longevity. Liquids that have no outlet, by contrast, putrefy within the tree and leave it hollow and defective. If trees left standing and alive resist decay when drained in this manner, then timber felled for use, once so treated, can undoubtedly provide great durability in buildings.

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5. Hae autem inter se discrepantes et dissimiles habent virtutes, uti robur ulmus populus cupressus abies ceteraque quae maxime in aedificiis sunt idonea. namque non potest id robur quod abies, nec cupressus quod ulmus, nec cetera easdem habent inter se natura rerum similitates, sed singula genera principiorum proprietatibus comparata alios alii generis praestant in operibus effectus.

5. But they have virtues that are different and dissimilar from each other, such as the oak, the elm, the poplar, the cypress, the fir, and the others that are most suitable for buildings. For the oak cannot be the same as the fir, nor the cypress as the elm, nor the others have the same natural similarities between themselves, but each kind of principle has properties comparable to those of another kind in works.

Different woods have different and dissimilar virtues, depending on which elements predominate in them: oak, elm, poplar, cypress, fir, and the others each possess their own aptitude for construction. For oak does not work the same as fir, nor does cypress work the same as elm, since they differ in the proportion of the natural principles that compose them.

6. et primum abies aeris habens plurimum et ignis minimumque umoris et terreni levioribus rerum natura e potestatibus comparata non est ponderosa. itaque rigore naturali contenta non cito flectitur ab onere, sed directa permanet in contignatione. sed ea quod habet in se plus caloris, procreat et alit cariem ab eaque vitiatur, etiamque ideo celeriter accenditur quod quae inest in eo corpore aeris raritas, ut est patens accipit ignem et ita vehementem ex se mittit flammam.

6. Fir contains much air and fire but little moisture and earth, so its lighter constituent principles make it relatively light. Its natural rigidity prevents it from bending readily under a load, and it remains straight in floor framing. Because it contains more heat, however, it breeds and nourishes decay and is damaged by it. It also catches fire quickly: its porous, air-filled substance readily admits fire and gives out an intense flame.

And firstly, the fir tree, which has much air and fire and very little moisture and earth, being composed of the lightest elements, is not heavy; due to its natural rigidity, it does not easily yield under load, but remains upright in the structure. However, it has the disadvantage that, because of its high fire content, it attracts and feeds woodworm, which damages it; and it catches fire quickly, because the unusual nature of its structure absorbs the fire and expels it with a great blaze.

7. ex ea autem antequam est excisa quae pars est proxima terrae per radices recipiens ex proximitate umorem enodis et liquida efficitur. quae vero est superior, vehementia caloris eductis in aera per nodos ramis, praecisa alte circiter pedes XX et perdolata propter nodationis duritiem dicitur esse fusterna. ima autem cum excisa quadrifluviis disparatur eiecto torulo ex eadem arbore ad intestina opera comparatur et ⟨ab⟩ infima fusterna sappinea vocatur.

7. In the uncut tree, the part nearest the ground receives moisture through the roots and is relatively free from knots and full of sap. In the upper part, heat draws branches out through knots into the air; cut at about twenty feet and hewn, this knotty timber is called fusterna. The lower part, when cut and split into four, has the central round core removed and is prepared for interior joinery; this is called sappinea, in distinction from the lower part of the fusterna.

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feet and hewn, this knotty timber is called fusterna. The lower part, when cut and split into four, has the central round core removed and is prepared for interior joinery; this is called sappinea, in distinction from the lower part of the fusterna.

8. contra vero quercus terrenis principiorum satietatibus abundans parumque habens umoris et aeris et ignis, cum in terrenis operibus obruitur, infinitam habet aeternitatem. ex eo cum tangitur umore non habens foraminum raritates propter spissitatem non potest in corpus recipere liquorem, sed fugiens ab umore resistit et torquetur et efficit in quibus est operibus ea rimosa.

8. Oak, by contrast, contains much earth and little moisture, air or fire, and lasts indefinitely when buried in earthworks. When exposed to moisture, its dense texture and lack of open pores prevent it from absorbing liquid. Resisting moisture, it twists and causes cracks in the work in which it is used.

By contrast, the oak (quercus), which abounds in earthy principles and has little moisture, air, and fire, lasts an age when buried in foundation works; but on contact with moisture, owing to its density, which does not allow penetration, it warps with it, splits, and, as it cracks, ruins the works.

9. aesculus vero quod est omnibus principiis temperata, habet in aedificiis magnas utilitates, sed ea, cum in umore conlocatur, recipiens penitus per foramina liquorem eiecto aere et igni operatione umidae potestatis vitiatur. cerrus [quercus] fagus quod pariter habent mixtionem umoris et ignis et terreni, aeris plurimum, per huius raritates umores penitus recipiendo celeriter marcescunt. populus alba et nigra, item salix tilia cum non sint dura terreni mixtione, propter raritatem sunt candida et in sculpturis commodam praestant tractabilitatem vitex ignis et aeris habendo satietatem, umoris temperate, parum autem terreni, habens leviore temperatura comparata egregiam habere videtur in usu rigiditatem..

9. Aesculus, with a balanced mixture of the elements, is very useful in buildings. In damp conditions, however, its pores admit water as air and fire are expelled, and moisture causes it to decay. Cerrus, a kind of oak, and beech, containing balanced amounts of moisture, fire and earth but much air, are porous and quickly decay when thoroughly wetted. White and black poplar, willow, lime and vitex contain much fire and air, moderate moisture and little earth; their

light composition gives them useful rigidity. Because they are not hardened by much earth, they remain soft and readily workable for carving.

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10. alnus autem, quae proxima fluminum ripis procreatur et minime materies utilis videtur, habet in se egregias rationes. etenim est aere et igni plurimo temperata, non multum terreno, umore paulo. itaque in palustribus locis infra fundamenta aedificiorum palationibus crebre fixa, recipiens in se quod minus habet in corpore liquoris, permanet inmortalis ad aeternitatem et sustinet inmania pondera structurae et sine vitiis conservat. ita quae non potest extra terram paulum tempus durare, ea in umore obruta permanet ad diuturnitatem.

10. Alder, which grows beside rivers and appears of little use as timber, has remarkable properties. It contains much air and fire, little earth and little moisture. Driven densely as piles beneath foundations in marshy places, it takes up the liquid lacking in its substance and remains durable, carrying enormous masonry loads without damage. Timber that lasts only a short time out of the ground can thus endure for a long time when buried in moisture.

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11. est autem maxime id considerare Ravennae, quod ibi omnia opera et publica et privata sub fundamentis eius generis habeant palos. ulmus vero et fraxinus maximos habent umores minimumque aeris et ignis, terreni temperate ⟨ea e⟩ mixtione comparatae. sunt in operibus cum fabricantur lentae et ab pondere umoris non habent rigorem et celeriter pandant. simul autem vetustate

sunt aridae factae aut in agro perfecto qui est eis liquor stantes emoriuntur, fiunt duriores et in commissuris et coagmentationibus ab lentitudine firmas recipiunt catenationes.

11. This is particularly evident at Ravenna, where all public and private buildings have alder piles beneath their foundations. Elm and ash contain much moisture, little air and fire, and a moderate amount of earth. When used green they are flexible, and their moisture makes them lack rigidity and bend readily under load. Once dried by age, or drained of their sap while standing, they become harder; their pliancy makes them effective in joints and connections.

This is particularly evident in Ravenna, where all buildings, public and private, have alder stakes under their foundations. Elm and ash, on the other hand, although very moist, with little air and heat and moderate soil, are flexible when green and, due to their moisture, bend under load; but, dried over time, they become hard and are suitable for joints and pegs.

12. item carpinus quod est minima ignis et terreni mixtione, aeris autem et umoris summa continetur temperatura, non est fragilis sed habet utilissimam tractabilitatem. itaque Graeci quod ex ea materia iuga iumentis comparant, quod apud eos iuga ζυγά

vocitantur, item ζυγίην eam appellant. non minus est admirandum de cupresso et pinu, quod eae habentes umoris abundantiam aequamque ceterorum mixtionem, propter umoris satietatem in operibus solent esse pandae, sed in vetustatem sine vitiis conservantur, quod is liquor qui inest penitus in corporibus earum habet amarum saporem, qui propter acritudinem non patitur penetrare cariem neque eas bestiolas quae sunt nocentes. ideoque quae ex his generibus opera constituuntur permanent ad aeternam diuturnitatem.

12. Hornbeam contains very little fire and earth but much air and moisture. It is therefore not brittle and is particularly workable. The Greeks make draught animals' yokes from this timber; because they call yokes zyga (ζυγά), they call the tree zygia. Cypress and pine are also remarkable: with abundant moisture and a balanced mixture of the other elements, they tend to warp in buildings because of their moisture, yet remain sound with age. The liquid within them has a bitter, acrid taste that prevents decay and harmful insects from entering. Works made from these timbers therefore endure for a very long time.

Likewise, hornbeam (Carpinus), which has very little mixture of fire and earth, but a high proportion of air and moisture, is not brittle, but very workable. That is why the Greeks, who made ox yokes from this wood — which they call zyga —called it zygia. No less admirable are cypress and pine, which, even though they have an abundance of moisture and a balanced mixture of the other elements, tend to warp in construction due to that excess of humour, but they remain for a long time without defect, because the humour they contain has a bitter taste which, due to its acridity, prevents woodworm and other harmful insects from entering.

13. item cedrus et iuniperus easdem habent virtutes et utilitates, sed quemadmodum ex cupressu et pinu resina, ex cedro oleum quod cedrium dicitur nascitur, quo reliquae res cum sunt unctae, uti etiam libri, a tineis et carie non laeduntur. arboris autem eius sunt similes cupresseae foliaturae, materies vena directa. Ephesi in aede simulacrum Dianae, ex ea lacunaria et ibi et in ceteris nobilibus fanis propter aeternitatem sunt facta. nascuntur autem eae arbores maxime Cretae et Africae et nonnullis Syriae regionibus.

13. Cedar and juniper have similar properties and uses. Just as cypress and pine yield resin, cedar produces an oil called cedrium; objects such as books, when anointed with it, are protected from moths and decay. The tree's foliage resembles cypress, and its timber is straight-grained. At Ephesus the temple's statue of Diana was made from it, as were the coffered ceilings there and in other celebrated sanctuaries, because of its durability. These trees grow principally in Crete, Africa and parts of Syria.

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14. Larix vero, qui non est notus nisi îs municipalibus, qui sunt circa ripam fluminis Padi et litora maris Hadriani, non solum ab suci vehementi amaritate ab carie aut tinea non nocetur, sed etiam flammam ex igni non recipit, nec ipse per se potest ardere, nisi uti saxum in fornace ad calcem coquendam aliis lignis

uratur; nec tamen tunc flammam recipit nec carbonem remittit, sed longo spatio tarde comburitur. ⟨Namque ea materies,⟩ quod est minima ignis et aeris e principiis temperatura, umore autem et terreno est spisse solidata, non habet spatia foraminum, qua possit ignis penetrare, reicitque eius vim nec patitur ab eo sibi cito noceri, propterque pondus ab aqua non sustinetur, sed cum portatur, aut in navibus aut supra abiegnas rates conlocatur.

14. Larch is known only to the townspeople near the Po and the Adriatic coast. The intense bitterness of its sap protects it from decay and insects; the account also states that it does not catch flame or burn by itself unless burned with other wood, like stone in a lime kiln. Even then it does not take flame or yield charcoal but is slowly consumed over a long time. Its composition contains very little fire and air and is densely consolidated with moisture and earth, leaving no open pores through which fire can penetrate. It therefore resists fire and is not quickly damaged. Because of its weight it does not float, and must be carried in boats or placed on rafts of fir.

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15. Ea autem materies quemadmodum sit inventa est causa cognoscere. divus Caesar cum exercitum habuisset circa Alpes imperavissetque municipiis praestare commeatus ibique esset castellum munitum quod vocaretur Larignum, tunc qui in eo fuerunt naturali munitione confisi noluerunt imperio parere. itaque imperator copias iussit admoveri. erat autem ante eius castelli portam turris ex hac materia alternis trabibus transversis uti pyra inter se composita alte, uti possent de summo sudibus et lapidibus accedentes repellere. tunc vero cum animadversum est alia eos tela praeter sudes non habere neque posse longius a muro propter pondus iaculari, imperatum est fasciculos ex virgis alligatos et

faces ardentes ad eam munitionem accedentes mittere. itaque celeriter milites congesserunt.

15. The reason this timber became known was as follows. When the deified Caesar was campaigning near the Alps and had ordered the towns to supply provisions, the inhabitants of a fortified place called Larignum refused, trusting in its natural defenses. He ordered his forces forward. Before its gate stood a tower built of this timber, with beams laid crosswise like a funeral pyre, from whose top the defenders repelled attackers with stakes and stones. Seeing that they had only stakes, too heavy to be thrown far from the wall, Caesar ordered bundles of brushwood and burning torches to be thrown against the fortification. The soldiers quickly collected them.

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16. posteaquam flamma circa illam materiam virgas comprehendisset, ad caelum sublata effecit opinionem uti videretur iam tota moles concidisse. cum autem ea per se extincta esset et re quieta turris intacta apparuisset, admirans Caesar iussit extra telorum missionem eos circumvallari. itaque timore coacti oppidani cum se dedidissent, quaesitum unde essent ea ligna quae ab igni non laederentur. tunc ei demonstraverunt eas arbores, quarum in his locis maximae sunt copiae. et ideo id castellum Larignum item materies larigna est appellata. haec autem per Padum Ravennam deportatur, in colonia Fanestri Pisauri Anconae reliquisque quae sunt in ea regione municipiis praebetur. cuius materies si esset facultas adportationibus ad urbem, maximae haberentur in aedificiis utilitates, et si non in omne, certe tabulae in subgrundiis circum insulas si essent ex ea conlocatae, ab traiectionis incendiorum aedificia periculo liberarentur, quod eae neque flammam nec carbonem possunt recipere nec facere per se.

16. The flame caught the brushwood around the tower and rose into the sky, giving the impression that the whole structure would collapse. When the fire burned itself out, however, the tower appeared intact. Astonished, Caesar ordered the place surrounded beyond missile range. The townspeople, intimidated, surrendered, and he asked where the timber that resisted the fire came from. They showed him the trees, abundant in the district. Just as the fort was called Larignum, the timber was called larigna. It is transported down the Po to Ravenna and supplied to the colony at Fanum, to Pisaurum, Ancona and other nearby towns. If it could readily be transported to Rome, it would be very useful in buildings. Even if not used throughout, boards of it set under the eaves around blocks of houses could protect buildings against spreading fires, since the timber, according to the account, neither catches flame nor ignites by itself.

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17. sunt autem eae arbores foliis similibus pini, materies earum prolixa, tractabilis ad intestinum opus non minus quam sappinea, habetque resinam liquidam mellis Attici colore quae etiam medetur pthisicis. De singulis generibus quibus proprietatibus e natura rerum videantur esse comparatae quibusque procreantur rationibus exposui. insequitur animadversio quid ita quae in urbe supernas dicitur abies deterior est, quae infernas egregios in aedificiis ad diuturnitatem praestat usus, et de his rebus, quemadmodum videantur e locorum proprietatibus habere vitia aut virtutes, uti ea sint considerantibus apertiora exponere.

17. These trees have foliage resembling pine, long timbers as workable for interior joinery as sappinea, and a liquid resin the color of Attic honey, which is also used against consumption. I have explained the different kinds of timber, the properties nature gives them and the reasons for their development. It remains to consider why the fir known at Rome as supernas is inferior, while infernas is particularly durable in buildings. I shall explain more clearly how the characteristics of their places of growth give them strengths or weaknesses.

These trees have leaves similar to those of the pine; their wood is long and is as easily worked for interior carpentry as that of the fir (sappinea); it contains a liquid humour, the color of honey, which also heals consumptives. I have described each class, the properties with which they seem to be endowed by nature, and the way in which they grow.

Comparative critical apparatus — II.9. The chapter on timber retains the ancient physiological explanation in terms of moisture, heat, air and an earthy component. Favonius remains a seasonal reference, and the properties of abies, quercus, ulmus, populus, cupressus, pinus, alnus and larix are not translated into modern mechanical equivalents not formulated in the Latin. Recommendations for felling, seasoning and use are presented as ancient building technology, distinguishing empirical observation from causal explanation.

Technical note — Materies. Here materies may mean construction timber rather than “matter” in the abstract. The sequence of species relates their imagined internal structure to behavior under load or in moisture and to specific architectural uses.

Philological and constructional note — II.9. Materies is translated according to context as construction timber, not merely “matter”. The explanation of seasonal felling and seasoning is retained within its ancient physiological framework. Abies, quercus, aesculus, robur, ulmus, populus, salix, tilia, vitex, cupressus, pinus, alnus and larix are checked as names of timbers or species, avoiding excessively confident botanical equivalents where ancient identification is disputed.

Historical and technical note — Larix. The account of Larignum and the fire resistance of larix is retained as an exemplum transmitted by Vitruvius. The edition distinguishes material observation from the narrative episode and does

not convert timber's relative resistance into a modern assertion of incombustibility.

I have explained the different timbers, their natural properties and their development. I shall now examine why the fir called supernas at Rome is inferior to infernas in durability, and how their places of growth account for these differences.

Chapter 10

1. *montis Appennini primae radices ab Tyrrenico mari inter Alpis et extremas Etruriae regiones oriuntur. eius vero montis iugum se circumagens et media curvatura prope tangens oras maris Hadriani pertingit circumitionibus contra fretum. itaque citerior eius curvatura quae vergit ad Etruriae Campaniaeque regiones apricis est potestatibus. namque impetus habet perpetuos ad solis cursum. ulterior autem quae est proclinata ad superum mare, septentrionali regioni subiecta continetur umbrosis et opacis perpetuitatibus. itaque quae in ea parte nascuntur arbores umida potestate nutritae non solum ipsae augentur amplissimis magnitudinibus, sed earum quoque venae umoris copia repletae turgentes liquoris abundantia saturantur. cum autem excisae et dolatae vitalem potestatem amiserunt, venarum rigore permanente siccescendo propter raritatem fiunt inanes et evanidae, ideoque in aedificiis non possunt habere diuturnitatem.*

1. The first foothills of the Apennines rise from the Tyrrhenian Sea between the Alps and the outer regions of Etruria. The ridge curves through Italy, approaches the Adriatic coast in its central bend and continues towards the strait. Its nearer slope, facing Etruria and Campania, lies in sunlight and remains exposed to the sun's course. The farther slope, facing the upper sea, looks north and is continually shaded. Trees growing there, nourished by moisture, become very large, and their veins swell with abundant sap. Once felled and hewn, they lose their vital force; as the veins stiffen and dry, their porous substance becomes weak and insubstantial. Such timber therefore lacks durability in buildings.

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2. quae autem ad solis cursum spectantibus locis procreantur, non habentes interveniorum raritates siccitatibus exsuctae solidantur, quia sol non modo ex terra lambendo sed etiam ex arboribus educit umores. itaque quae sunt in apricis regionibus spissis venarum crebritatibus solidatae, raritatemque non habentes ex umore cum in materiem perdolantur, reddunt magnas utilitates ad vetustatem. ideo infernates, quod ex apricis locis adportantur, meliores sunt quam quae ab opacis de supernatibus advehuntur.

2. Trees growing on slopes exposed to the sun, by contrast, lack those moisture-filled voids. Dried and consolidated by the sun, which draws moisture from both earth and trees, they develop a dense structure. Hewn into timber, they provide great durability. Infernas fir is therefore better than supernas because it comes from sunny places, whereas supernas comes from shaded ones.

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3. Quantum animo considerare potui, de copiis quae sunt necessariae in aedificiorum comparationibus et quibus temperaturis e rerum natura principiorum habere videantur mixtionem quaeque insunt in singulis generibus virtutes et vitia, uti non sint ignota aedificantibus exposui. ita qui potuerint eorum praeceptorum sequi praescriptiones erunt prudentiores, singulorumque generum usum eligere poterunt in operibus. ergo quoniam de apparitionibus est explicatum, in ceteris voluminibus de ipsis aedificiis exponetur, et primum de deorum inmortalium aedibus sacris et de earum symmetriis et proportionibus, uti ordo postulat, insequenti perscribam.

3. I have explained, as far as I could judge, the supplies needed in building, the mixtures of natural principles that compose them, and the strengths and weaknesses of each kind, so that builders may understand them. Those who follow these precepts will be better able to choose the appropriate use of each material. Having dealt with the preparations, I shall explain the buildings themselves in the following books, beginning, as the order requires, with the sacred temples of the immortal gods and their symmetriae and proportions.

As far as I have been able to reason, I have explained the necessary building materials, the proportions of the natural elements that compose them, and the virtues and defects of each, so that these may not be unknown to those who are to build. Thus, those who can follow these precepts will be more prudent and will be able to choose, among the various types, the use of each in their works. Having explained the building materials, I will discuss in the next book the temples of the immortal gods, describing them as appropriate.

Comparative critical apparatus — II.10. The distinction between abies supernas and infernas depends on provenance, exposure and the qualities attributed to the timber. The edition retains Vitruvius's taxonomy without converting it into a modern botanical classification. Where transmission or geographical identification does not allow a secure equivalent, the Latin term is retained and explained in a note.

Synthesis note for architects — Book II. The book constructs a coherent argumentative sequence: origins of building → constitution of matter → selection of brick, sand, lime, pozzolana and stone → masonry bonds → timber. Properties are always assessed in relation to provenance, preparation, exposure, bonding and use. This technical logic can be summarized for the contemporary reader without attributing later scientific categories to Vitruvius.

Comparative apparatus — II.10. Abies supernas and infernas are explained through Apennine geography and the qualities Vitruvius attributes to each provenance. The contrast should not become a modern botanical taxonomy. Place-names and the description of slopes are retained primarily in accordance with the text.

Technical synthesis — Book II. For the architect, the book constitutes an ancient theory of materials and their use in construction: selection, preparation, ageing, bonding, provenance and suitability for use. The edition preserves this technological logic without attributing chemistry, petrography, strength of materials or botany in modern formulation to Vitruvius.

Argumentum Libri III — *On temples: proportion and symmetry taken from the well-formed human body (homo ad circulum et quadratum), perfect numbers, the five species of temples according to the intercolumniation (pycnostyle, systyle, diastyle, areostyle, eustyle) and the rules of the Ionic order, with its bases, columns and capitals.*

Editorial note. *— Book III opens the discussion of temples with the relation between symmetria, proportio and ἀναλογία. Comparison with the human body provides Vitruvius with a model of commensurability between parts and whole. The celebrated geometrical construction of the man in relation to the circle and square belongs to the text of 3.1.3; modern expressions such as "Vitruvian Man" or homo ad circulum et quadratum are used solely as historiographical designations, not as literal formulas from the treatise.*

Textual note — Book II. The Latin is checked against Krohn (1912). Material names, construction procedures, ancient units and the distinction between Vitruvius's physical explanation and modern materials science are retained. Orthographical variation, editorial supplementation and substantive readings are treated separately; the antiquity of a practice does not establish the precise date of a surviving archaeological example.

M. VITRVVIVS POLLIO · DE ARCHITECTVRA · LIBER III

Preface

1. Delphicus Apollo Socratem omnium sapientissimum Pythiae responsis est professus. Is autem memoratur prudenter doctissimeque dixisse, oportuisse hominum pectora fenestrata et aperta esse, uti non occultos haberent sensus sed patentes ad considerandum. Utinam vero rerum natura sententiam eius secuta explicata et apparentia ea constituisset! Si enim ita fuisset, non solum laudes aut vitia animorum ad manum aspicerentur, sed etiam disciplinarum scientiae sub oculorum consideratione subiectae non incertis iudiciis probarentur, sed et doctis et scientibus auctoritas egregia et stabilis adderetur ipsique artifices pellicerent sua prudentia, ⟨qui, etiam⟩si non pecunia sint copiosi seu vetustate officinarum habuerint notitiam aut etiam gratia forensi et eloquentia, cum fuerint parati, pro industria studiorum auctoritates possent habere, ut eis, quod profitentur scire, id crederetur. Igitur quoniam haec non ita, sed uti natura rerum voluit, sunt constituta, non efficitur, ut possint homines obscuratis sub pectoribus ingeniis scientias artificiorum penitus latentes, quemadmodum sint, iudicare.

The Delphic Apollo[150], through the responses of the Pythia, proclaimed Socrates the wisest of all men. Socrates is remembered as having said, with prudence and great learning, that men's breasts ought to have been fitted with windows and left open, so that their thoughts would not remain hidden but be exposed to examination. Would that nature had followed his judgment and made them manifest and visible! Then not only would the merits or faults of minds be seen at a glance, but the knowledge of the various disciplines, placed before the eyes for examination, would not be exposed to uncertain judgments. The learned and knowledgeable would receive firm and lasting authority, and craftsmen themselves would attract confidence through their understanding: even if they were not wealthy, known through the long standing of their workshops, or furnished with favor in the forum and eloquence, their

150 The Temple of Apollo, also known as the Apollonion (Greek: Ἀπολλώνιον, Romanized: Apollṓnion), was an important part of the pan-Hellenic religious sanctuary located in central Greece at Delphi. The temple and the sanctuary in general were dedicated to one of the major Greek deities, Apollo, the god of archery, music, light, prophecy, the arts, and healing.

preparation would win authority commensurate with their diligent studies, so that people would believe that they knew what they professed to know. Since things are constituted otherwise, as nature willed, and men's talents remain concealed within their breasts, people cannot judge the knowledge peculiar to each art, which lies deeply hidden.

Note — Bk. 3, pref. 1. The image of a breast fitted with 'windows' to reveal one's thoughts goes back to the fable of Momus (cf. Lucian, Hermotimus 20); Vitruvius adapts the topos to protest that technical merit, hidden from view, is left at the mercy of favor and forensic eloquence rather than of true judgment.

2. Maxime autem id animadvertere possumus ab antiquis statuariis et pictoribus, quod ex his, qui dignitatis notas et commendationis gratiam habuerunt, aeterna memoria ad posteritatem sunt permanentes, uti Myron, Polycletus, Phidias, Lysippus ceterique, qui nobilitatem ex arte sunt consecuti. Namque ut civitatibus magnis aut regibus aut civibus nobilibus opera fecerunt, ita id sunt adepti. At qui non minore studio et ingenio sollertiaque fuerunt nobilibus et humili fortuna civibus non minus egregie perfecta fecerunt opera, nullam memoriam sunt adsecuti, quod hi non ab industria neque artis sollertia sed a felicitate fuerunt deserti, ut Hegias Atheniensis, Chion Corinthius, Myagrus Phocaeus, Pharax Ephesius, Boedas Byzantius etiamque alii plures. Non minus item pictores, uti Aristomenes Thasius, Polycles et Androcydes ⟨Cyzice⟩ ni, Theo Magnes ceterique, quos neque industria neque artis studium neque sollertia defecit, sed aut rei familiaris exiguitas aut inbecillitas fortunae seu in ambitione certationis contrariorum superatio obstitit eorum dignitati.

This can be seen above all in the sculptors and painters of old. Those who enjoyed marks of distinction and the favor of recommendation remain in everlasting memory among posterity—Myron, Polyclitus[151], Phidias[152],

151 Polyclitus (Greek: Πολύκλειτος), called " the Elder " to distinguish him from Polyclitus the Younger, was a 5th-century BC Greek bronze sculptor born in Argos or Sicyon. Along with the famous Phidias, Myron, and Cresilas, he is one of the most important sculptors of classical antiquity. The 4th-century BC catalog attributed to Xenocrates (" Xenocratic Catalog "), which served as Pliny's guide to art, placed Polyclitus between Phidias and Myron. Polyclitus was most famous for his bronze statues of gods and athletes, apart from the enormous statue of the goddess Hera, intended for worship in the Heraion of Argos. One of his most outstanding sculptures is the Doryphoros.

Lysippus[153] and the others who won renown through their art. They achieved it because they made works for great cities, kings or noble citizens. Others, with no less zeal, talent and skill, made works no less admirably finished for citizens both noble and of modest means, yet obtained no remembrance: they were forsaken not by diligence or artistic skill, but by good fortune. Such were Hegias of Athens, Chion of Corinth, Myagrus of Phocaea, Pharax of Ephesus, Boedas of Byzantium and many more. Likewise among painters there were Aristomenes of Thasos, Polycles and Androcydes of Cyzicus, Theon of Magnesia and the others, who lacked neither diligence, artistic commitment nor skill, but whose standing was obstructed by a small patrimony, adverse fortune or the superiority of rivals in the competition for distinction.

Editorial comparison — III, preface 1–3. The running Latin and translation follow the authorial Spanish constitution, agreeing here with Krohn (1912, 56–58). In preface 1, Krohn transposes and reconstructs the clause about craftsmen within the hypothetical account of visible merit; Rose (1899, 62) retains a differently constituted negative clause after iudicare. In preface 2, Krohn prints Hegias and Androcydes <Cyzice>ni, whereas Rose (1899, 62) prints Teleas and <Andron Ephesii>. These are identified editorial differences, not new direct readings of Harley or Cotton. In preface 3, the previously truncated sentence potius indoctos quam doctos gratia superare, non esse certandum iudicans cum indoctis ambitione is restored in accordance with the authorial Spanish edition and Krohn.

3. Nec tamen est admirandum, si propter ignotitiam artis virtutes obscurantur, sed maxime indignandum, cum etiam saepe eblandiatur gratia conviviorum a veris iudiciis falsam probationem. Ergo, uti Socrati placuit, si ita sensus et sententiae scientiaeque disciplinis auctae perspicuae et perlucidae fuissent, non gratia neque ambitio valeret, sed si qui veris certisque laboribus doctrinarum pervenissent ad scientiam summam, eis ultro opera traderentur. Quoniam autem

152 Phidias (Athens, c. 500 BC–Olympia or Athens, c. 431 BC) was the most celebrated sculptor of ancient Greece.

153 Lysippus (Λύσιππος) of Sicyon was a Greek sculptor active in the later fourth century BCE. Getty's Union List of Artist Names records activity around 370–300 BCE and a biographical range extending beyond 310 BCE; the precise date of his death is uncertain. See Getty ULAN, record 500012332.

ea non sunt inlustria neque apparentia in aspectu, ut putamus oportuisse, et animadverto potius indoctos quam doctos gratia superare, non esse certandum iudicans cum indoctis ambitione, potius his praeceptis editis ostendam nostrae scientiae virtutem.

It is no wonder that merit is obscured through ignorance of the art; but it is especially a cause for indignation when favor won at banquets often coaxes a false approval from true judgment. As Socrates wished, had perceptions, opinions and knowledge enriched by the disciplines been clear and transparent, neither favor nor ambition would prevail: works would be entrusted spontaneously to those who had attained the highest knowledge through genuine and sound scholarly labor. Since these things are neither manifest nor visible, as we think they ought to be, and I observe that the unlearned more often surpass the learned through favor, I judge that I should not compete with the unlearned in ambition. I shall instead show the worth of our knowledge by publishing these precepts.

4. Itaque, imperator, in primo volumine tibi de arte et quas habeat ea virtutes quibusque disciplinis oporteat esse auctum architectum exposui, et subieci causas quid ita earum oporteat eum esse peritum, rationesque summae architecturae partitione distribui finitionibusque terminavi. deinde quod erat primum et necessarium, de moenibus quemadmodum eligantur loci salubres ratiocinationibus explicui, ventique qui sint et e quibus <regionibus> singuli spirant deformationibus grammicis ostendi, platearumque et vicorum uti emendate fiant distributiones in moenibus docui et ita finitionem primo volumine constitui. item in secundo de materia quas habeat in operibus utilitates et quibus virtutibus e natura rerum est comparata peregi. nunc in tertio de deorum inmortalium aedibus sacris dicam et uti oportet perscriptas exponam.

Accordingly, Emperor, in the first book I set forth for you what the art is, what virtues it possesses, and in what disciplines the architect ought to be trained; I added the reasons why he must be skilled in them, distributed the whole of architecture by a division, and defined it by definitions. Then, treating what was first and most necessary, I explained by reasoned argument how, in laying out city walls, to choose healthy sites; I showed by linear diagrams which the winds are and from what regions each blows; I taught how the streets and lanes within the walls may be correctly laid out, and so brought the first book to

a close. In the second I dealt with materials—what advantages they afford in works, and with what qualities Nature has endowed them. Now, in the third, I shall speak of the sacred temples of the immortal gods and set them forth, as is fitting, in full detail.

Methodological note — Comparative apparatus. Rose, Krohn and Budé are used as comparable editorial layers, not as interchangeable authorities. A difference between editions is recorded only when it affects the constitution of the text, a technical term, numeral, proportion or architectural interpretation; simple modernizations of spelling are not inflated into variants.

Comparative critical apparatus — III, preface. The preface is compared with Rose, Krohn and Pierre Gros's Budé edition of Book III. The Socratic image of pectora fenestrata supplies a rhetorical framework for the visibility of professional merit. Vitruvius contrasts fame and social favor with scientia, doctrina and scripta; the edition avoids turning this authorial complaint into demonstrated biographical information. Names of artists and architects are retained according to the Latin text and distinguished from identifications or chronologies proposed by modern scholarship.

Hermeneutic note — III, preface. The preface is not an independent digression: it prepares Book III through reflection on judgment, authority and knowledge. The transition from visible reputation to invisible technical knowledge anticipates the need for verifiable rules of symmetria and proportio in sacred architecture.

Chapter 1

1. *Aedium compositio constat ex symmetria, cuius rationem diligentissime architecti tenere debent. ea autem paritur a proportione, quae graece ἀναλογία dicitur. proportio est ratae partis membrorum in omni opere totiusque commodulatio, ex qua ratio efficitur symmetriarum. namque non potest aedis ulla sine symmetria atque proportione rationem habere compositionis, nisi uti hominis bene figurati <> membrorum habuerit exactam rationem.*

The composition of temples depends on symmetr*ia*, whose principles architects must observe with the greatest care. Symmetria arises from proportion, which the Greeks call analogia (ἀναλογία). Proportion is the commensuration of the members and the whole of a work with a determined part as their common measure; from it the system of commensurability is established. No temple can have a coherent composition without symmetria and proportion, unless its members stand in an exact relationship comparable to that of a well-formed human body.

2. Corpus enim hominis ita natura composuit, uti os capitis a mento ad frontem summam et radices imas capilli esset decimae partis, item manus pansa ab articulo ad extremum medium digitum tantundem, caput a mento ad summum verticem octavae, cum cervicibus imis ab summo pectore ad imas radices capillorum sextae, ⟨a medio pectore⟩ ad summum verticem quartae. Ipsius autem oris altitudinis tertia est pars ab imo mento ad imas nares, nasum ab imis naribus ad finem mediûm superciliorum tantundem, ab ea fine ad imas radices capilli frons efficitur item tertiae partis. Pes vero altitudinis corporis sextae, cubitum quartae, pectus item quartae. Reliqua quoque membra suas habent commensus proportiones, quibus etiam antiqui pictores et statuarii nobiles usi magnas et infinitas laudes sunt adsecuti.

For nature has so composed the human body that the face, from the chin to the top of the forehead at the roots of the hair, is a tenth part of the stature; the outstretched hand, from the wrist to the tip of the middle finger, as much again. The head, from the chin to the crown, is an eighth part; from the top of the breast, including the neck, to the roots of the hair, a sixth; and from the middle of the breast to the crown, a fourth. Of the height of the face itself, a third runs from the base of the chin to the underside of the nose; the nose, from its base to the line of the brows, as much again; and thence to the roots of the

hair the forehead is formed, likewise a third. The foot is a sixth part of the body's height; the forearm a fourth; and the breast likewise a fourth. The other members too have their proportions of commensurability, of which the ancient painters and the celebrated sculptors availed themselves to win great and boundless praise.

3. similiter vero sacrarum aedium membra ad universam totius magnitudinis summam ex partibus singulis convenientissimum debent habere commensus responsum.

item corporis centrum medium naturaliter est umbilicus. namque si homo conlocatus fuerit supinus manibus et pedibus pansis circinique conlocatum centrum in umbilico eius, circumagendo rotundationem utrarumque manuum et pedum digiti linea tangentur. non minus quemadmodum schema rotundationis in corpore efficitur, item quadrata designatio in eo invenietur. nam si a pedibus imis ad summum caput mensum erit eaque mensura relata fuerit ad manus pansas, invenietur eadem latitudo uti altitudo, quemadmodum areae quae ad normam sunt quadratae.

Similarly, each part of a temple must bear a most fitting correspondence of commensurability to the total magnitude of the whole. The body's natural central point is the navel. If a man lies on his back with his hands and feet outstretched, and the center of a pair of compasses is placed at his navel, the circle described will touch the fingers of both hands and the toes of both feet. A square figure can be found in the body just as a circle can: if the distance from the soles of the feet to the crown of the head is measured and transferred to the outstretched hands, the breadth will equal the height, as in surfaces squared with a set square.[154]

In the same way, the members of sacred temples must maintain a perfectly adjusted correspondence of commensurability, each in relation to the others and all in relation to the total magnitude.

Likewise, the natural center of the body is the navel. For if a man be laid on his back, with his hands and feet outstretched, and the point of a compass be placed

154 Ad normam means 'to the square'. The norma (γνώμων) is the builder's square; the term recurs technically at 7.3.5. The relation between bodily height and the span of the outstretched arms underlies the discussion of the homo quadratus and temple proportion.

upon his navel, the circle thereby described will touch the tips of the fingers of both hands and of the toes. And just as the body yields a circular outline, so too a square figure may be found within it: for if the distance from the soles of the feet to the crown of the head be measured, and that measure be applied to the outstretched hands, the breadth will be found equal to the height, as in a perfect square.[155]

The state of the interpretive question. The passage of the human body inscribed in the circle and the square (3.1.3) is the root of a long modern interpretive tradition, with which this edition engages without uncritical adherence. Rudolf Wittkower (Architectural Principles in the Age of Humanism, 1949) read in Vitruvius the foundation of the humanist system of harmonic proportions binding man, building, and universe. Joseph Rykwert (The Dancing Column, 1996) explored the anthropomorphic root of the orders and the 'bodily' meaning of the column. Alberto Pérez-Gómez (Architecture and the Crisis of Modern Science, 1983) showed that Vitruvian sciographia is not modern linear perspective but a perception of the building's totality in depth. Indra Kagis McEwen (Vitruvius: Writing the Body of Architecture, 2003) set the treatise within the political-religious framework of Augustus and the body-architecture analogy. And Pierre Gros, editor of the Budé, has established the textual criticism and Vitruvius's relation to the tradition of the Greek treatises. This edition takes these contributions as its framework, distinguishes the datum of the text from its symbolic reading, and marks as 'the author's personal hermeneutic proposal' whatever exceeds what the text asserts.

Recent secondary bibliography (post-2010). To the classic studies there have been added, in the last decade, contributions that renew the reading of Vitruvius and that this edition takes into account: Marden Fitzpatrick Nichols, Author and Audience in Vitruvius' De architectura (Cambridge, 2017), the first study in English to treat the De architectura as a literary work and to examine the authorial persona and the rhetoric of decor (Books VI–VII); Mireille

155 The classic passage on inscribing the human body in geometrical figures (homo ad circulum et ad quadratum). This passage and the preceding one (3.1.2) gave rise to Leonardo da Vinci's celebrated drawing (c. 1490, Gallerie dell'Accademia, Venice). Leonardo, however, does not inscribe the two figures concentrically, as is often assumed, but moves the center of the square to the pubis, departing from the letter of Vitruvius's text. Compare 3.1.2–3 and Pliny, Natural History 7.77, on the body's commensurability.

Courrént, Vitruve auctor: L'œuvre littéraire de Vitruve et sa réception dans la littérature (Ausonius, 2019); and John Oksanish, Vitruvian Man: Rome under Construction (Oxford, 2019), which sets the treatise within the ideological construction of Augustan Rome. On the technical-archaeometric side, the ROMACONS project (J. P. Oleson et al., Building for Eternity, 2014) experimentally verified the hydraulic concrete. These works, together with the Budé volumes directed by Pierre Gros, constitute the current state of the question.

Critical note — III.1.3. The adopted text reads item corporis centrum medium naturaliter est umbilicus, followed by namque si homo conlocatus fuerit supinus. These words describe the navel as the center of the circle traced around the outstretched body. No specific reading of Harley MS 2767 is established by this note. The relation to Leonardo's drawing, made around 1490 and now in the Gallerie dell'Accademia in Venice, belongs to the history of the passage's reception. Possible routes through the printed edition associated with Sulpicius or through Francesco di Giorgio Martini require separate historical documentation. See Vitruvius, De architectura 3.1.3; Martin Kemp, Leonardo da Vinci: The Marvellous Works of Nature and Man (Oxford: Oxford University Press, 2006), 96–99.

Critical note — III.1.3. Krohn's text gives "item corporis centrum medium naturaliter est umbilicus. namque si homo conlocatus fuerit supinus…". There is therefore no basis for treating namque as a corruption or dittography. The passage describes, successively, the relation of the body to a circumference centered on the navel and the equality between bodily height and arm-span that permits comparison with a square. Renaissance reception, above all Leonardo da Vinci's drawing now known as Vitruvian Man, belongs to the history of reception and must be distinguished from establishing the Latin text.

Comparative note — Bk. 3.1.2–3 (homo ad circulum et quadratum). The treatise's most celebrated passage: the well-proportioned body, laid out with limbs extended, inscribed—with its center at the navel (umbilicus)—in the circle drawn with a compass (circinus) and, at once, in the square. Text and commentary should be distinguished: the adopted text speaks of a «homo bene figuratus», without the formula «ad circulum et quadratum», which is a fixture of the editorial tradition (see the critical note to 3.1.3). The reference editions

agree in rendering circinus as «compass» and in keeping the navel as the circle's center, but differ in commentary: Granger (Loeb, 1931) translates the geometric procedure literally; Rowland and Howe (Cambridge, 1999) specify the construction and its architectural import; Gros (Budé) sets the figure within the tradition of micro-macrocosmic analogy and proportion; Corso and Romano (Einaudi) expand the historical commentary. The present edition offers its own translation, close to the adopted Latin and to the authorial Spanish translation, adopting no external version. [Historical-architectural note] The image founded a long posterity: Cesare Cesariano's homo ad quadratum (1521), Leonardo da Vinci's drawing (ca. 1490), which shifted the center to the pubis to reconcile circle and square, and, in the twentieth century, Le Corbusier's Modulor.

Comparative note — III.1.2–3. Vitruvius takes the homo bene figuratus as a comparison for architectural commensurability. The Latin text does not contain the formula homo ad circulum et quadratum: this is a later historiographical designation. Nor does it state that circle and square must share the same geometrical center. The navel is the center of the circumference described by the outstretched limbs; comparison with the square, by contrast, proceeds from the equality of height and arm-span.

Architectural and philological note — Homo bene figuratus. The human body serves as an analogy of commensurability: each member has a ratio to the whole. The text does not prescribe that temples should literally reproduce a human figure, nor does it contain the modern expression “Vitruvian Man”. Graphic reconstructions of circle and square belong to the history of reception and must be labeled accordingly.

4. ergo si ita natura composuit corpus hominis uti proportionibus membra ad summam figurationem eius respondeant, cum causa constituisse videntur antiqui ut etiam in operum perfectionibus singulorum membrorum ad universam figurae speciem habeant commensus exactionem. igitur cum in omnibus operibus ordines traderent, <> maxime in aedibus deorum, <⟨quod eorum⟩> operum et laudes et culpae aeternae solent permanere.

Therefore, if nature has so composed the human body that its members answer proportionally to the whole figure, the ancients seem to have established with good reason that in the execution of works too each of the members should keep

an exact commensurability with the aspect of the whole figure. And so, though they handed down orders of proportion for works of every kind, they did so above all in the temples of the gods, whose merits and faults are wont to endure for ever.

Note — Bk. 3.1.2–3. The canon of bodily proportions (face 1/10, head 1/8, foot 1/6…) and the double inscription of the well-formed man in the circle—its center at the navel—and in the square ground the analogy between the human body and the temple. On its afterlife, from Leonardo to Le Corbusier, see the introductory study 'Vitruvius Today.'

5. Nec minus mensurarum rationes, quae in omnibus operibus videntur necessariae esse, ex corporis membris collegerunt, uti digitum, palmum, pedem, cubitum, et eas distribuerunt in perfectum numerum, quem Graeci τέλειον dicunt. Perfectum autem antiqui instituerunt numerum qui decem dicitur; namque ex manibus digitorum numero [ab palmo pes] est inventus. Si autem in utrisque palmis ex articulis ab natura decem sunt perfecti, etiam Platoni placuit esse eum numerum ea re perfectum, quod ex ⟨X⟩ singularibus rebus, quae μονάδες apud Graecos dicuntur, perficitur decusis. Simul autem undecim aut duodecim sunt facti, quod superaverint, non possunt esse perfecti, donec ad alterum decusis perveniant; singulares enim res particulae sunt eius numeri.

They also derived from the members of the body the units of measure required in every work—the finger, palm, foot and cubit—and distributed them according to the perfect number, which the Greeks call teleion (τέλειον). The ancients established ten as the perfect number, for it was discovered from the number of fingers on the hands. Since the fingers articulated in both hands amount by nature to ten, Plato too considered ten perfect because the decad is completed from ten single units, called monades (μονάδες) by the Greeks. Once eleven or twelve is reached, however, the excess cannot be perfect until the second decad is attained; single units are particles of that number.

6. Mathematici vero contra disputantes ea re perfectum dixerunt esse numerum qui sex dicitur, quod is numerus habet partitiones eorum rationibus sex numero convenientes sic: sextantem unum, trientes duo, semissem tria, besem quem δίμοιρον dicunt quattuor, quintarium quem πεντάμοιρον dicunt quinque, perfectum sex. Cum ad duplicationem crescat, supra sex adiecto asse ἔφεκτον; cum facta sunt octo, quod est tertia adiecta, tertiarium alterum, qui ἐπίτριτος dicitur;

dimidia adiecta cum facta sunt novem, sesquialterum, qui ἡμιόλιος appellatur; duabus partibus additis et decusis facto bes alterum, quem ἐπιδίμοιρον vocitant; in undecim numero quod adiecti sunt quinque, quintarium, quem ἐπίπεμπτον dicunt; duodecim autem, quod ex duobus numeris simplicibus est effectus, διπλάσιονα.

The mathematicians, arguing the contrary, called six the perfect number because its constituent divisions correspond to it: a sixth is one, a third two and a half three; two-thirds, called dimoiron (δίμοιρον), are four; five-sixths, called pentamoiron (πεντάμοιρον), are five; and the complete number is six. In the progression beyond six, adding one produces seven, the ephekton (ἔφεκτον); adding a third produces eight, the epitritos (ἐπίτριτος); adding a half produces nine, the sesquialter or hemiolios (ἡμιόλιος); adding two-thirds produces ten, the epidimoiron (ἐπιδίμοιρον); adding five produces eleven, the epipempton (ἐπίπεμπτον); and twelve, made from two complete sixes, is diplasion (διπλάσιον), the double.

Critical note — III.1.5–6. The discussion of six, ten and their proportional fractions is retained in full according to the authorial Spanish edition and Krohn (1912, 60–61). Krohn marks ab palmo pes for deletion in III.1.5 and supplies ⟨X⟩ before singularibus rebus; Rose (1899, 65) prints ab palmo pes without those deletion brackets. In III.1.6 Rose (1899, 66) prints a bracketed section from bessem through διπλάσιον, and his apparatus describes it as an interpolation from an ancient mathematical book. Krohn does not enclose the corresponding numerical excursus in those brackets. Rose's assessment is thus documented as his editorial judgment; it is not evidence of an independently inspected manuscript omission. Latin fractional terminology and Greek names of ratios are retained, since the two systems must not be collapsed into an unsupported modern equivalence.

Critical note — III.1.6. The excursus on six and numerical ratios is retained in Krohn's text. This edition will not call it an interpolation or a spurious passage without expressly documenting a decision in the critical apparatus of the edition cited. The terminology combines Latin fractions with Greek proportional vocabulary; the Greek terms are therefore retained where a single modern equivalent would be reductive.

7. Non minus etiam, quod pes hominis altitudinis sextam habet partem, (ita etiam, ex eo quod perficitur pedum numero corporis ⟨altitudo, veteribus columnis basis scapi elata⟩ sexies altitudines terminavit) eum perfectum constituerunt, cubitumque animadverterunt ex sex palmis constare digitisque XXIIII. Ex eo etiam videntur civitates Graecorum fecisse, quemadmodum cubitus est sex palmorum, in drachma, qua nummo uterentur, aereos signatos uti asses ex aequo sex, quos obolos appellant, quadrantesque obolorum, quae alii dichalca, nonnulli trichalca dicunt, pro digitis viginti quattuor in drachma constituisse.

They also regarded six as perfect because the human foot is a sixth of the body's height (the body's height is completed by six foot-lengths; likewise, in ancient columns, the height of the shaft with its base was determined as sixfold). They observed that the cubit comprises six palms and twenty-four fingers. The Greek cities appear to have followed the same pattern: just as the cubit contains six palms, they established six equally valued bronze pieces, like asses, in the drachma which they used as currency, calling them obols; quarter-obols, called dichalca by some and trichalca by others, numbered twenty-four to the drachma, corresponding to the fingers.

This is also confirmed by the foot's being a sixth of human height: since the body's stature is determined by six foot-lengths, they considered that number perfect. They observed that the cubit consists of six palms, or twenty-four fingers. The Greek cities appear to have acted accordingly: just as the cubit contains six palms, they struck six bronze coins of the as type, called obols, to the drachma which they used as currency. The quarter-obols, called dichalca by some and trichalca by others, corresponded to the twenty-four fingers of the drachma.

8. Nostri autem primo fecerunt ⟨perfectum⟩ antiquum numerum et in denario denos aeris constituerunt, et ea re compositio nominis ad hodiernum diem denarium retinet. Etiamque quarta pars quod efficiebatur ex duobus assibus et tertio semisse, sestertium vocitaverunt. Postea autem quam animadverterunt utrosque numeros esse perfectos, et sex et decem, utrosque in unum coiecerunt et fecerunt perfectissimum decusis sexis. Huius autem rei auctorem invenerunt pedem. E cubito enim cum dempti sunt palmi duo, relinquitur pes quattuor

palmorum, palmus autem habet quattuor digitos. Ita efficitur, ut habeat pes sedecim digitos et totidem asses aeracius denarius.

Our own people, on the other hand, first adopted the ancient perfect number and fixed ten bronze asses to the denarius; and hence the composition of the name preserves to this day the 'denarius.' And the quarter part, which was made up of two asses and a semis, they called the sestertius. But afterwards, observing that both numbers were perfect—six and ten—they combined them into one and formed the most perfect number, sixteen. Of this they found the foot to be the author: for, when two palms are taken from the cubit, there remains the foot of four palms, and the palm has four fingers; so it comes about that the foot has sixteen fingers, and the denarius as many bronze asses.

Note — Bk. 3.1.7–8. Vitruvius derives the measures from the body: the foot (16 digits = 4 palms), the cubit (24 digits = 6 palms), and relates them to the monetary systems—the Greek drachma divided into six obols, the Roman denarius of sixteen asses. The commensurability of these units underpins the doctrine of symmetria.

9. Ergo si convenit ex articulis hominis numerum inventum esse et ex membris separatis ad universam corporis speciem ratae partis commensus fieri responsum, relinquitur ut suspiciamus eos qui etiam aedes deorum inmortalium constituentes ita membra operum ordinaverunt ut proportionibus et symmetriis separatae atque universae convenientes efficerentur eorum distributiones.

Therefore, if it is agreed that number was found from the joints of the human body, and that between the several members and the whole aspect of the body there is a correspondence of commensurability according to a determined part, it remains for us to admire those who, in building the temples of the immortal gods also, so ordered the members of their works that, taken severally and together, they might be made concordant in their proportions and symmetries throughout the distribution of the whole edifice.

Editorial note. — Chapter 1 contains the most famous proposition of the whole treatise: that the design of a temple rests on *symmetria* (commensurability), and that the model for it is the proportion of the well-formed human body (homo bene figuratus). Vitruvius lists the canonical ratios — the face a tenth of the height, the head an eighth, the foot a sixth — and observes that a man lying with limbs outstretched can be inscribed in both a circle (centered on the navel) and

a square. This is the textual canon that Leonardo would later draw; it is not itself the "Vitruvian Man" (see Glossarium, homo bene figuratus, and the Theses, no. 4). The chapter also reports the ancient debate over the perfect numbers — six (the foot-module) and ten (the count of the fingers) — and their reconciliation in sixteen, anticipating the Renaissance theory of proportion.

Textual apparatus — III.1. The homo bene figuratus passage is checked fraction by fraction: facies, palma, pes, cubitus, pectus and total height. Equality between height and arm-span, and the constructions of circle and square, are maintained in accordance with what the text explicitly states. Any additional geometrical system is identified as a reconstruction.

Philological note — Symmetria, proportio and analogia. In this chapter, "proportion" must not absorb symmetria. The functional distinction between the relationship of a part, the commensurability of members and a common ratio is preserved. The Spanish version avoids arbitrarily alternating "symmetry", "proportion" and "modulation" when the Latin changes its term.

Comparative critical apparatus — III.1.1–9. Symmetria, proportio, commodulatio and *ἀναλογία* are not reduced to modern synonyms. Proportio denotes a measurable relationship of parts; symmetria, the ordered commensurability of members with one another and with the whole; commodulatio emphasizes their common reference to a module. In III.1.3 the transmitted text places the bodily circle's center at the navel, whereas the relation to the square is constructed from equality between height and arm-span. The edition preserves the sequence of six and ten as an ancient history of number and measure, without attributing to it a universal mathematical theory foreign to the passage.

Chapter 2

1. *Aedium autem principia sunt e quibus constat figurarum aspectus. ea primum in antis, quod graece ναὸς ἐν παραστάσιν dicitur, deinde prostylos, amphiprostylos, peripteros, pseudodipteros, <dipteros,> hypaethros. horum exprimuntur formationes his rationibus.*

Archaeological note — III.2, temple types. Vitruvius classifies temples by the arrangement of their columns: in antis (naos en parastasin), prostyle, amphiprostyle, peripteral, pseudodipteral, dipteral and hypaethral. Archaeology illustrates each type: Vitruvius himself exemplifies the in antis temple, with two columns between the antae, by the "Three Fortunes" near Rome's Colline Gate; the peripteral scheme, with six columns at the front and eleven on each side, is that of the canonical Greek temple; the pseudodipteral arrangement, octastyle with a single row where a double row could stand, is exemplified by the temple of Diana at Magnesia, by Hermogenes of Alabanda, and that of Apollo, by Menesthes; the dipteral, with its double colonnade, and the hypaethral, decastyle and open to the sky, complete the sequence. The pseudoperipteral type—columns engaged in the cella wall to simulate a peripteral arrangement, defined by Vitruvius in 4.8—was the most widespread in the Roman world. Its best-preserved examples are the temple of Portunus in the Forum Boarium, Ionic and dating to the late second century BC, and above all the Maison Carrée at Nîmes, a Corinthian hexastyle prostyle temple of around AD 2, the world's best-preserved Roman temple.

The principles of temples, on which the aspect of their forms depends, are these: first the in antis, which in Greek is called ναὸς ἐν παραστάσιν (a temple between antae); then the prostyle, the amphiprostyle, the peripteral, the pseudodipteral, the dipteral, and the hypaethral. Their configurations are expressed by the following rules.

2. in antis erit aedes, cum habebit in fronte antas parietum qui cellam circumcludunt, et inter antas in medio columnas duas, supraque fastigium symmetria ea conlocatum quae in hoc libro fuerit perscripta. huius autem exemplar erit ad tres Fortunas ex tribus quod est proxime portam Collinam.

A temple is in antis when the front has the antae of the walls enclosing the cella, with two columns between them and a pediment above, arranged

according to the symmetria prescribed in this book. Of the three temples at the Three Fortunes, the one nearest the Colline Gate provides an example.

A temple is in antis when its facade presents the antae of the walls enclosing the cella, with two columns between them and, above, a pediment arranged according to the relations of symmetria prescribed in this book. At the Three Fortunes, the temple nearest the Colline Gate is an example of this type.

3. prostylos omnia habet quemadmodum in antis, columnas autem contra antas angulares duas, supraque epistylia quemadmodum et in antis, et dextra ac sinistra in versuris singula. huius exemplar est in insula Tiberina in aede Iovis et Fauni.

The prostyle has all the features of the in antis temple, but with two corner columns opposite the antae and architraves above, as in the in antis, with a single architrave return on each side, right and left. An example stands on Tiber Island, in the temple of Jupiter and Faunus.

Architectural and textual note — III.2.3. The phrase et dextra ac sinistra in versuris singula continues the description of the epistylia, the architraves: singula is neuter plural. the Spanish edition's translation adds "one column on each side" in this clause; the Latin supplies no additional noun for columns there. The English keeps the architrave returns explicit instead of adding a further pair of columns. This is a correction of the grammatical and architectural reference, not an emendation of the Latin printed by Krohn (1912, 63) and Rose (1899, 68).

4. amphiprostylos omnia habet ea quae prostylos, praetereaque habet in postico ad eundem modum columnas et fastigium.

The amphiprostyle has all that the prostyle has, and besides, at the rear, columns and a pediment arranged in the same way.

The amphiprostyle has everything that the prostyle has, together with columns and a pediment at the rear, arranged in the same way.

5. Peripteros autem erit, quae habebit in fronte et postico senas columnas, in lateribus cum angularibus undenas. Ita autem sint hae columnae conlocatae, ut intercolumnii latitudinis intervallum sit a parietibus circum ad extremos ordines columnarum, habeatque ambulationem circa cellam aedis,

quemadmodum est sine postico in porticu Metelli Iovis Statoris Hermodori et Mariana Honoris et Virtutis a Mucio facta.

A peripteral temple has six columns at the front and rear, and eleven on each side including the corner columns. Arrange them so that a space equal to one intercolumniation separates the walls from the outer rows of columns all around, providing a walk around the cella. The examples, without a rear part in the adopted wording, are the temple of Jupiter Stator by Hermodorus in the Portico of Metellus and Marius's temple of Honor and Virtue, built by Mucius.

6. Pseudodipteros autem sic conlocatur, ut in fronte et postico sint columnae octonae, in lateribus cum angularibus quinae denae. Sint autem parietes cellae contra quaternas columnas medianas in fronte et postico. Ita duorum intercolumniorum et imae crassitudinis columnae spatium erit ab parietibus circa ad extremos ordines columnarum. Huius exemplar Romae non est, sed Magnesiae Dianae Hermogenis Alabandei et Apollinis a Menesthe facta.

The pseudodipteral is arranged with eight columns at the front and rear, and fifteen on each side including the corner columns. The cella walls stand opposite the four central columns at the front and rear. A space of two intercolumniations plus the lower column diameter thus lies between the walls and the outer rows of columns all around. There is no example at Rome, but there is the temple of Diana at Magnesia, the work of Hermogenes of Alabanda, and that of Apollo, built by Menesthes.

Textual note — III.2.5–6. Krohn (1912, 63), followed by the authorial Spanish edition, transposes sine postico before the examples beginning in porticu Metelli; Rose (1899, 68) places it after Honoris et Virtutis. The different scope is preserved in the adopted translation rather than silently settled by an archaeological identification. In III.2.6 Krohn prints Hermogenis Alabandei, identifying Hermogenes as Alabandean; Rose prints Hermogenis, Alabandis etiam Apollinis, locating the temple of Apollo at Alabanda. The Spanish edition follows Krohn. Menesthes is the named architect of Apollo's temple, not Hermogenes. These are differences in editorial constitution and punctuation, not newly collated manuscript readings.

7. dipteros autem octastylos et pronao et postico, sed circa aedem duplices habet ordines columnarum, uti est aedis Quirini dorica et Ephesi Dianae ionica a Chersiphrone constituta.

The dipteral is octastyle both in the pronaos and at the rear, but about the temple it has double rows of columns—as is the temple of Quirinus, of the Doric order, and that of Diana at Ephesus, of the Ionic order, built by Chersiphron.

8. hypaethros vero decastylos est in pronao et postico. reliqua omnia eadem habet quae dipteros, sed interiore parte columnas in altitudine duplices, remotas a parietibus ad circumitionem ut porticus peristyliorum. medium autem sub divo est sine tecto. Aditus valvarum ex utraque parte in pronao et postico. huius item exemplar Romae non est, sed Athenis octastylos ex templo Olympio.

The hypaethral temple is decastyle in the pronaos and at the rear. In all other respects it resembles the dipteral, but inside it has columns in two tiers, set away from the walls to provide a circuit like the porticoes of peristyles. The center is open to the sky and unroofed. There are doorways at both ends, in the pronaos and at the rear. There is no example at Rome; at Athens the text gives the octastyle temple of Olympian Zeus.

Note — Bk. 3.2. The typology (in antis, prostyle, amphiprostyle, peripteral, pseudodipteral, dipteral, hypaethral) derives from Greek theory. The examples range from Rome—the three Fortunes, the Tiber Island, the portico of Metellus—to Asia Minor, where Hermogenes of Priene (2nd c. BC) fixed the symmetries of the Ionic pseudodipteral, a recurring authority in this book.

Archaeological note — III.2. Vitruvius's classification here rests on the arrangement of the colonnade in relation to the cella and its fronts. The ancient technical terms—in antis, prostylos, amphiprostylos, peripteros, pseudodipteros, dipteros and hypaethros—should be retained, and each form explained from the text's own definition, without projecting later archaeological taxonomies on to Vitruvius. Krohn includes dipteros in the sequence; hypaethros is defined subsequently by its particular arrangement and must not be confused with a supposed "dipteral-epipteral" type.

Note — III.2. Vitruvian typology distinguishes in antis, prostylos, amphiprostylos, peripteros, pseudodipteros, dipteros and hypaethros according to the arrangement of columns and cella. The examples combine Roman and Greek buildings. Modern archaeological identifications and the chronology of each monument must remain separate from the typological definition provided by the Latin text.

Architectural note — III.2. The types in antis, prostylos, amphiprostylos, peripteros, pseudodipteros, dipteros and hypaethros classify the relation of the cella to its fronts and surrounding colonnades. The categories of III.3 instead classify the spacing of columns. The two taxonomies are complementary and must not be confused. Modern archaeological identifications and dates remain separate from the definitions in the Latin text.

Textual apparatus — III.2. The typological sequence is retained with its Greek or Latinised terms. The supplement <dipteros>, wherever it forms part of the adopted critical text, must remain typographically visible in the apparatus. The number of columns on each front and flank is checked against the verbal description before any diagram is validated.

Note on figures — Temples. Figures of in antis, prostylos, amphiprostylos, peripteros, pseudodipteros, dipteros and hypaethros temples are not used circularly to "correct" the text. The reading is established first; only then is the graphic reconstruction checked for compatibility.

Comparative critical apparatus — III.2. The sequence in antis/*ναὸς ἐν παραστάσιν*, prostylos, amphiprostylos, peripteros, pseudodipteros, <dipteros> and hypaethros is retained as a technical taxonomy. <Dipteros> in the opening enumeration must be marked as an editorial supplement wherever the text is constituted in that way, although the type is developed immediately afterwards. Column numbers and monumental examples are reviewed as part of the typological argument; later archaeological identifications are presented separately.

Chapter 3

1. Species autem aedium sunt quinque, quarum ea sunt vocabula: pycnostylos, id est crebris columnis, systylos paulo remissioribus, diastylos amplius quam oportet inter se diductis, araeostylos spatiis intercolumniorum patentibus rare, eustylos intervallorum iusta distributione.

There are five kinds of temples, whose names are these: pycnostyle, with closely set columns; systyle, with somewhat greater spacing; diastyle, with the columns farther apart than is fitting; araeostyle, with wide and sparse intercolumniations; and eustyle, with a just distribution of the intervals.

Vitruvius distinguishes five kinds of temples by their intercolumniations: pycnostyle (pycnostylos), with very closely set columns; systyle (systylos), with somewhat more generous intervals; diastyle (diastylos), with wider separations; araeostyle (araeostylos), with columns farther apart than is fitting; and eustyle (eustylos), characterized by a proportionate distribution of the intervals.

Textual note — III.3.1, 5 and 9. The two Spanish formulations in the Spanish edition do not distribute the qualification "farther apart than is fitting" in the same way. Its running Latin and first translation follow Krohn (1912, 64), attaching amplius quam oportet inter se diductis to diastylos. Rose (1899, 69) instead attaches rarius quam oportet inter se diductis to araeostylos; the Spanish edition's explanatory parallel follows this latter distribution. The English preserves both authorial paragraphs separately and records the difference, rather than merging the two editorial constitutions. The varicae restored in III.3.5 follows Krohn (1912, 65), whose apparatus attributes the reading to Turnebus; ⟨improviso⟩ in III.3.9 is marked as Krohn's supplement (1912, 66). Both belong to the authorial Spanish edition's adopted constitution and are not presented as newly verified manuscript words.

2. ergo pycnostylos est cuius intercolumnio unius et dimidiatae columnae crassitudo interponi potest, quemadmodum est divi Iulii et in Caesaris foro Veneris et si quae aliae sic sunt compositae. item systylos est in qua duarum columnarum crassitudo in intercolumnio poterit conlocari, et spirarum plinthides aeque magnae sint ei spatio quod fuerit inter duas plinthides, quemadmodum est Fortunae Equestris ad theatrum lapideum reliquaeque quae eisdem rationibus sunt compositae.

Thus the pycnostyle is that in whose intercolumniation the thickness of one and a half columns can be inserted, as in the temple of the Divine Julius, that of Venus in Caesar's forum, and any others composed in this way. The systyle, in turn, is that in whose intercolumniation the thickness of two columns can be placed, and in which the plinths of the bases are as large as the space that lies between two plinths, as in the temple of Fortuna Equestris, near the stone theater, and the rest composed on the same principles.

3. haec utraque genera vitiosum habent usum. matres enim familiarum cum ad supplicationem gradibus ascendunt, non possunt per intercolumnia amplexae adire nisi ordines fecerint, item valvarum aspectus abstruditur columnarum crebritate ipsaque signa obscurantur, item circa aedem propter angustias inpediuntur ambulationes.

Both these kinds have a faulty use. For the matrons, when they mount the steps in supplication, cannot pass through the intercolumniations arm in arm, but only in single file; moreover, the view of the doors is obstructed by the crowding of the columns, and the statues themselves are darkened; and likewise, owing to the narrowness, the walks around the temple are impeded.

4. diastyli autem haec erit compositio, cum trium columnarum crassitudinem intercolumnio interponere possumus, tamquam est Apollinis et Dianae aedis. haec dispositio hanc habet difficultatem quod epistylia propter intervallorum magnitudinem franguntur.

The arrangement of the diastyle will be this: when we can interpose in the intercolumniation the thickness of three columns, as in the temple of Apollo and Diana. This disposition has the drawback that the architraves break on account of the great width of the intervals.

5. In araeostylis autem nec lapideis nec marmoreis epistyliis uti datur, sed inponendae de materia trabes perpetuae. Et ipsarum aedium species sunt varicae, barycephalae, humiles, latae, ornanturque signis fictilibus aut aereis inauratis earum fastigia tuscanico more, uti est ad Circum Maximum Cereris et Herculis Pompeiani, item Capitolii.

In araeostyles it is not possible to use architraves of stone or marble; instead, continuous timber beams must be laid on. The very aspect of such temples is splayed, top-heavy, low and broad, and their pediments are adorned with figures of terracotta or gilded bronze, in the Tuscan manner—as in the

temple of Ceres near the Circus Maximus, that of Hercules Pompeianus, and the Capitol.

In araeostyle temples, stone or marble architraves cannot be used: continuous timber beams must be placed on the columns. According to Vitruvius, these temples have a barycephala appearance—a visually heavy upper part—and are low and broad. Their pediments are adorned in the Tuscan manner with figures of terracotta or gilded bronze. He cites as examples the temple of Ceres beside the Circus Maximus, that of Hercules Pompeianus and the Capitol.

Note — Bk. 3.3 (araeostyle). The araeostyle—low, broad, and 'top-heavy,' with wooden architraves and terracotta or gilt-bronze ornament 'in the Tuscan manner' (tuscanico more)—is associated in the passage with the Tuscan manner of building; the Republican Capitol is its chief example. Cf. Vitr. IV.7, where the Tuscan temple is set out in detail.

Note — III.3.5. The Latin adjective transliterated from Greek, barycephala, here describes the formal effect of low, broad buildings with a visually heavy roof or crowning element. The passage should not become a general definition of the "archaic Etruscan temple": Vitruvius establishes a formal connection with tuscanico more and supplies concrete examples; the historical and archaeological category is later.

6. Reddenda nunc est eustyli ratio, quae maxime probabilis et ad usum et ad speciem et ad firmitatem rationes habet explicatas. namque facienda sunt in intervallis spatia duarum columnarum et quartae partis columnae crassitudinis, mediumque intercolumnium unum quod erit in fronte, alterum quod in postico, trium columnarum crassitudine. sic enim habebit et figurationis aspectum venustum et aditus usum sine inpeditionibus et circa cellam ambulatio auctoritatem.

It now remains to set forth the method of the eustyle, which is the most commendable and has the principles of use, appearance, and stability fully worked out. For in the intervals there must be made spaces of two and a quarter column-thicknesses, and a single central intercolumniation—one at the front and one at the rear—of three column-thicknesses. For thus it will have at once a graceful aspect in its figure, a convenient and unhindered approach, and a dignity in the walk about the cella.

7. huius autem rei ratio explicabitur sic. frons loci quae in aede constituta fuerit, si tetrastylos facienda fuerit, dividatur in partes XI S praeter crepidines et proiecturas spirarum, si sex erit columnarum, in partes XVIII. si octastylos constituetur, dividatur in XXIV et semissem. item ex his partibus sive tetrastyli sive hexastyli sive octastyli una pars sumatur eaque erit modulus. cuius moduli unus erit crassitudinis columnarum. intercolumnia singula, praeter media, modulorum duorum et moduli quartae partis. mediana in fronte et postico singula ternûm modulorum. ipsarum columnarum altitudo modulorum VIIII et dimidiae moduli partis. ita ex ea divisione intercolumnia altitudinesque columnarum habebunt iustam rationem.

The method of this will be explained as follows. The front of the site laid out for the temple, if it is to be tetrastyle, let it be divided into 11½ parts, excluding the crepidines (steps or platform margins) and the projections of the column bases; if it is of six columns, into 18 parts; if octastyle is to be set out, into 24½. Then, from these parts—whether of a tetrastyle, a hexastyle, or an octastyle—let one be taken, and that will be the module. The thickness of the columns will be one module. The intercolumniations, except the central ones, will each be two and a quarter modules; the central ones, at front and rear, three modules each. The height of the columns themselves will be nine and a half modules. Thus, by this division, the intercolumniations and the heights of the columns will keep a just proportion.

8. huius exemplar Romae nullum habemus, sed in Asia Teo hexastylon Liberi Patris. Eas autem symmetrias constituit Hermogenes, qui etiam primus invenit octastylon pseudodipterive rationem. ex dipteri enim aedis symmetria distulit interiores ordines columnarum XXXIV eaque ratione sumptus operasque compendii fecit. is in medio ambulationi laxamentum egregie circa cellam fecit, de aspectuque nihil inminuit sed sine desiderio supervacuorum conservavit auctoritatem totius operis distributione.

Of this we have no example at Rome, but in Asia the hexastyle of Father Liber at Teos. These symmetries were established by Hermogenes, who was also the first to devise the method of the octastyle pseudodipteral. For from the symmetry of the dipteral temple he removed the inner rows of columns, thirty-four in number, and by this means he saved expense and labor. In the middle he made an admirable open ambulatory about the cella, and in no way

diminished the appearance; rather, without any want of the superfluous, he preserved the dignity of the whole work in its distribution.

Note — Bk. 3.3. Of the five kinds of intercolumniation Vitruvius prefers the eustyle, whose modular system (front divided into equal parts; column = 1 module; intercolumniations of 2¼ and 3 modules) he attributes to Hermogenes, whom he also credits with inventing the octastyle pseudodipteral, saving thirty-four columns over the dipteral.

Textual note — III.3.8. the Spanish edition's running Latin and Krohn's printed text (1912, 66, line 4) give XXXIV, thirty-four; Rose's printed text (1899, 71, line 13) gives XXXVIII, thirty-eight. Krohn's apparatus explicitly records "xxxiv Phil: xxxviii x", identifying thirty-four as the editorial reading associated with Philander and distinguishing it from the reading labeled x. This confirms the choice of thirty-four in the authorial base and corrects the Spanish comparative note's attribution of thirty-eight to the current Perseus text of Krohn. Neither H nor Cotton is independently assigned a reading here. Hermogenes's association with the pseudodipteral scheme belongs to Vitruvius's own account.

9. Pteromatos enim ratio et columnarum circum aedem dispositio ideo est inventa, ut aspectus propter asperitatem intercolumniorum habeat auctoritatem, praeterea, si ex ⟨improviso⟩ imbrium aquae vis occupaverit et intercluserit hominum multitudinem, ut habeat in aede circaque cellam cum laxamento liberam moram. Haec autem ut explicantur in pseudodipteris aedium dispositionibus! Quare videtur acuta magnaque sollertia effectus operum Hermogenes fecisse reliquisseque fontes, unde posteri possent haurire disciplinarum rationes.

For the principle of the pteroma and the arrangement of columns about the temple was devised so that the appearance might have dignity through the relief created by the intercolumniations, and further, that if a sudden downpour of rain should overtake and shut in a throng of people, they might have within the temple and about the cella an ample and free place to wait. All this is worked out thus in the arrangements of pseudodipteral temples. Wherefore Hermogenes seems to have acted with keen and great sagacity in the execution of his works, and to have left springs from which posterity might draw the principles of the disciplines.

10. Aedibus araeostylis columnae sic sunt faciendae uti crassitudines earum sint partis octavae ad altitudines. item in diastylo dimetienda est altitudo columnae in partes octo et dimidiam et unius partis columnae crassitudo conlocetur. in systylo altitudo dividatur in novem et dimidiam partem et ex eis una ad crassitudinem columnae detur. item in pycnostylo dividenda est altitudo in ⟨partes⟩ decem et eius una pars facienda est columnae crassitudo. eustyli autem aedis columnae, uti systyli, in novem partes altitudo dividatur et dimidiam partem et eius una pars constituatur in crassitudine imi scapi. ita habebitur pro rata parte intercolumniorum ratio.

In araeostyle temples the columns are to be made so that their thickness is an eighth part of their height. Likewise in the diastyle, let the height of the column be divided into eight and a half parts, and let the thickness of the column be one part. In the systyle, let the height be divided into nine and a half parts, and of these let one be given to the thickness of the column. Likewise in the pycnostyle, the height is to be divided into ten, and one part of it made the thickness of the column. In the eustyle temple, as in the systyle, let the height be divided into nine and a half parts, and let one of them be fixed as the thickness of the lower shaft. Thus the proportion will be had according to the kind of intercolumniation.

In araeostyle temples the columns must be made with a diameter equal to one-eighth of their height. In the diastyle, divide the column height into eight and a half parts and give one part to the diameter. In the systyle, divide the height into nine and a half parts and give one to the diameter. In the pycnostyle, divide the height into ten and give one part to the column diameter. In the eustyle, as in the systyle, divide the height into nine and a half parts and assign one part to the diameter at the bottom of the shaft. The proportion will thus correspond to the class of intercolumniation.

11. quemadmodum enim crescunt spatia inter columnas, proportionibus adaugendae sunt crassitudines scaporum. namque si in araeostylo nona aut decima pars crassitudinis fuerit, tenuis et exilis apparebit, ideo quod per latitudinem intercolumniorum aer consumit et inminuit aspectu scaporum crassitudinem; contra vero pycnostylis, si octava pars crassitudinis fuerit, propter crebritatem et angustias intercolumniorum tumidam et invenustam efficiet speciem. itaque generis operis oportet persequi symmetrias. etiamque angulares

columnae crassiores faciendae sunt ex sua diametro quinquagesima parte, quod eae ab aere circumciduntur et graciliores videntur esse aspicientibus. ergo quod oculus fallit, ratiocinatione est exaequandum.

For as the spaces between the columns increase, the thicknesses of the shafts must be enlarged in proportion. For if in the araeostyle the thickness were a ninth or a tenth part, the column will appear thin and slender, because through the width of the intercolumniations the air consumes and diminishes the diameter of their thickness to the view. Contrariwise, in pycnostyles, if the thickness were an eighth part, on account of the frequency and narrowness of the intercolumniations it will produce a swollen and graceless appearance. One must therefore pursue the symmetries proper to each kind of work. Moreover, the corner columns are to be made thicker by a fiftieth part of their diameter, because they are cut round by the air and appear more slender to those who behold them. Therefore what the eye deceives must be redressed by calculation.

Note — Bk. 3.3 (optical corrections). Vitruvius states here a cardinal principle of his aesthetics: 'what the eye deceives must be redressed by calculation' (quod oculus fallit ratiocinatione est exaequandum). From it derive the thickening of the corner columns by 1/50 of their diameter and the adjustment of thickness according to the width of the intercolumniation.

Note — III.3.11. Quod oculus fallit, ratiocinatione est exaequandum formulates Vitruvius's principle of visual compensation with particular clarity: perception may require measurable adjustments to abstract geometrical regularity. Optical correction or compensation is the appropriate description, without attributing to the passage a modern theory of perception that it does not develop.

12. contracturae autem in summis columnarum hypotracheliis ita faciendae videntur uti si columna sit ab minimo ad pedes quinos denos, ima crassitudo dividatur in partes sex et earum partium quinque summa constituatur. item quae erit ab quindecim pedibus ad pedes viginti, scapus imus in partes sex et semissem dividatur earumque partium quinque et semisse superior crassitudo columnae fiat. item quae erunt a pedibus viginti ad pedes triginta, scapus imus dividatur in partes septem earumque sex summa contractura perficiatur. quae autem ab triginta pedibus ad quadraginta alta erit, ima dividatur in partes septem et dimidiam, ex his sex et dimidiam in summo habeat contracturae

rationem. quae erunt ab quadraginta pedibus ad quinquaginta, item dividendae sunt in octo partes et earum septem in summo scapo sub capitulo contrahantur. item si quae altiores erunt, eadem ratione pro rata constituantur contracturae.

The diminution at the tops of columns, in the hypotrachelia, should be made as follows. For a column up to fifteen feet high, divide the lower diameter into six parts and make the upper diameter five of them. For a column from fifteen to twenty feet, divide the lower shaft into six and a half parts and make the upper diameter five and a half. For columns from twenty to thirty feet, divide the lower shaft into seven parts and complete the upper diminution with six. For a column from thirty to forty feet high, divide the lower diameter into seven and a half parts and give the top six and a half. For columns from forty to fifty feet, divide the lower diameter into eight parts and diminish the top of the shaft, below the capital, to seven. For taller columns, establish the diminution proportionally by the same principle.

The diminution of the diameter at the upper hypotrachelium is determined by the column's height. For a column up to fifteen feet, divide the lower diameter into six parts and give the upper diameter five. Between fifteen and twenty feet, divide it into six and a half and give the upper diameter five and a half. Between twenty and thirty feet, divide it into seven and give the top six. Between thirty and forty feet, divide it into seven and a half and give the top six and a half. Between forty and fifty feet, divide it into eight and give the top seven. For greater heights, establish the diminution proportionally by the same principle.

The contractions at the tops of the columns, at the necks, are to be made thus: if the column is up to fifteen feet, let the lower thickness be divided into six parts, and let the top be made of five of them. Likewise for one from fifteen feet to twenty, let the lower shaft be divided into six and a half parts, and let the upper thickness of the column be made of five and a half. Likewise for one from twenty to thirty feet, let the lower shaft be divided into seven parts, and let the contraction at the top be completed with six of them. One that is from thirty to forty feet high, let the lower part be divided into seven and a half parts, and of these let it have six and a half at the top by the rule of contraction. Those from forty to fifty feet are likewise to be divided into eight parts, and

seven of them contracted at the top of the shaft beneath the capital. Likewise, if any are higher, let their contractions be fixed proportionally by the same rule.

13. haec autem propter altitudinis intervallum, scandentis oculi species, adiciuntur crassitudinibus temperaturae. venustates enim persequitur visus, cuius si non blandimur voluptati proportione et modulorum adiectionibus, uti quod fallitur temperatione adaugeatur, vastus et invenustus conspicientibus remittetur aspectus. de adiectione quae adicitur in mediis columnis, quae apud Graecos ἔντασις appellatur, in extremo libro erit forma et ratio eius quemadmodum mollis et conveniens efficiatur subscripta.

These compensating adjustments are added to the thicknesses on account of the interval of height, as the eye ascends. For sight pursues beauty, and if we do not flatter its pleasure by proportion and by additions of modules—so that what deceives may be augmented by compensation—the aspect will be rendered coarse and graceless to beholders. As for the addition made in the middle of the columns, which among the Greeks is called entasis (ἔντασις), at the end of the book its form and method will be set down, showing how it is made soft and fitting.

Comparative note — Bk. 3.3.13 (entasis). The entasis (ἔντασις)—the slight swelling or adiectio of the shaft that corrects the optical illusion of concavity—is, with the contractions and the inclination of the members, one of the system's optical «temperings». Vitruvius defers its drawing to a plate «at the end of the book» (in extremo libro), lost in the manuscript tradition, which has made the exact profile an open problem since the Renaissance (Fra Giocondo, Alberti, the practice of the curves). The editions reflect this: Rose (Teubner, 1899) fixes the text without restoring the figure; Granger (Loeb, 1931) renders adiectio as the «increase» of the shaft; Rowland and Howe (Cambridge, 1999) discuss the geometric reconstruction of the curve; the Budé (dir. Gros) reviews the hypotheses of the profile (parabola, arc of a circle). The present edition keeps the term and translates in its own words, adopting no external version. [Historical-architectural note] The entasis is the most celebrated of the Greek optical corrections; the Parthenon combines it with the curvature of the stylobate (see scamilli impares, 3.4.5).

Critical note — III.3.13. Ἔντασις denotes the addition to or modification of the shaft's profile in its middle region. The surviving text refers to a forma et ratio at the end of the book; the loss or incomplete transmission of the figures prevents turning that reference into a single geometrical reconstruction. The edition therefore retains the Greek term and distinguishes textual testimony from the various reconstructions proposed since the Renaissance.

Technical note — Rhythm and module. The eustyle is not merely the "ideal type": Vitruvius presents it as a solution balancing usus, species and firmitas through ordinary intercolumniations of two and a quarter diameters and a wider axial intercolumniation. A comparative table must show intercolumniation, diameter-to-height ratio and examples separately, avoiding confusion between measurements expressed in diameters and Roman feet.

Metrological note — Doron. Vitruvius explains doron by reference to the palm and relates pentadoron/tetradoron to five/four palms. Any modern metric equivalent is given as an approximation dependent on the standard adopted; the ancient dimensions retain priority in the text.

Construction note — Semilateria and joints. The alternation of lateres and semilateria is interpreted as a strategy for bonding facings and joints. Modern explanation of the bond is kept separate from Vitruvius's exact words and does not turn a reasonable reconstruction into a textual reading.

Textual and metrological apparatus — III.3. Pycnostylos, systylos, diastylos, araeostylos and eustylos depend on numerical relationships between diameter, height and intercolumniation. Each fraction must be retained in ancient notation in the base commentary before conversion to a decimal in auxiliary tables.

Architectural note — Entasis and optical corrections. Ἔντασις and the thickening of corner columns are presented as devices described by Vitruvius. No universal formula is attributed to these adjustments where the text refers to a figure or leaves variables dependent on scale.

Comparative critical apparatus — III.3.1–13. The chapter is compared with Krohn and with the Budé edition of Book III established, translated and annotated by Pierre Gros. Pycnostylos, systylos, diastylos, araeostylos and eustylos are categories defined by colonnade rhythm and must remain technical terms. In III.3.10 the diameter-to-height ratio varies with the width of the

intercolumniation; in III.3.11 nona aut decima pars is restored against the copying error "non aut decima" in an unidentified transcription. Quod oculus fallit, ratiocinatione est exaequandum grounds the optical compensations; it does not, however, authorize attributing to Vitruvius every visual correction known to later architecture.

Chapter 4

1. Fundationes eorum operum fodiantur, si queat inveniri, ad solidum et in solido, quantum ex amplitudine operis pro ratione videbitur, extruaturque structura totum solum quam solidissima. Supraque terram parietes extruantur sub columnas dimidio crassiores quam columnae sunt futurae, uti firmiora sint inferiora superioribus; quae stereobates appellantur, nam excipiunt onera. Spirarumque proiecturae non procedant extra solidum; item supra parietis ad eundem modum crassitudo servanda est. Intervalla autem concamaranda aut solidanda festucationibus, uti distineantur.

The foundations of these works must be dug, if solid ground can be found, down to and into it, to a depth proportionate to the magnitude of the work; the whole foundation area must be built up with masonry as solid as possible. Above ground, raise walls beneath the columns one-half thicker than the columns are to be, so that the lower parts are stronger than the upper. These are called stereobates, since they receive the loads. The projections of the bases must not extend beyond the solid support; the wall thickness must likewise be maintained above. The spaces between must be vaulted or consolidated by ramming, so that they are held apart.

The foundations of these works are to be dug, if it can be found, from solid ground and down to the solid, to whatever depth seems fitting in proportion to the magnitude of the work, and the whole substructure is to be built up as solidly as possible. Above the ground, let walls be raised beneath the columns, thicker by a half than the columns that are to stand upon them, so that the lower parts may be firmer than the upper; these are called stereobates, for they receive the loads. Let the projections of the bases not extend beyond the solid. Likewise, the same thickness of wall is to be kept above. The intervening spaces are to be vaulted or consolidated by ramming, so that they are well braced.

Textual note — III.4.1. The Spanish edition follows Krohn (1912, 68) in reading ad solidum et in solido, "down to firm ground and into it"; Rose (1899, 73) prints ab solido et in solidum. The Spanish edition's first rendering follows the former construction, while its parallel rendering begins "from firm ground and down to the firm". Both authorial renderings are presented separately in English, with their different formulations visible. The adopted Latin follows the

authorial Spanish edition/Krohn; this is a documented editorial constitution, not a new manuscript attribution.

Note — Bk. 3.4 (foundations). The stereobates (stereobatae, 'the load-bearers') are the foundation walls, thicker than the columns they carry; for unstable or marshy ground Vitruvius prescribes machine-driven piles of alder, olive, or oak—a technique confirmed by the archaeology of Roman foundations on wet terrain.

2. sin autem solidum non invenietur, sed locus erit congesticius ad imum aut paluster, tunc is locus fodiatur exinaniaturque et palis alneis aut oleagineis aut robusteis ustilatis configatur, sublicaque machinis adigatur quam creberrime, carbonibusque expleantur intervalla palorum et tunc structuris solidissimis fundamenta impleantur. extructis autem fundamentis ad libramentum stylobatae sunt conlocandi.

If solid ground cannot be found, and the site consists of fill down to the bottom or is marshy, dig out and empty the place. Drive in charred stakes of alder, olive or oak, using machines to set the piles as closely together as possible; fill the spaces between them with charcoal, then fill the foundations with exceptionally solid masonry. Once the foundations have been constructed, set the stylobates level.

If no solid ground is found and the site consists of deep fill or marsh, it must be excavated and emptied. Charred piles of alder, olive or oak are then driven by machines as densely as possible. Fill the spaces between the piles with charcoal and construct very solid masonry foundations above them. Once the foundations have been built and leveled, place the stylobates.

But if solid ground is not found, and the site is made up of fill to the bottom, or marshy, then let that place be dug out and emptied, and secured with charred piles of alder, olive, or oak; let the piles be driven in by machines as close together as possible, and let the intervals between them be filled with charcoal; and then let the foundations be filled with the most solid masonry. When the foundations have been raised to the level, let the stylobates be set in place.

3. supra stylobatas columnae disponendae quemadmodum supra scriptum est, sive in pycnostylo quemadmodum pycnostyla, sive systylo aut diastylo aut eustylo quemadmodum supra scripta sunt et constituta. in araeostylis enim libertas est quantum cuique libet constituendi. sed ita columnae in peripteris conlocentur

uti quot intercolumnia sunt in fronte, totidem bis intercolumnia fiant in lateribus. ita enim erit duplex longitudo operis ad latitudinem. namque qui columnarum duplicationes fecerunt erravisse videntur, quod unum intercolumnium in longitudine plus quam oporteat procurrere videtur.

On the stylobates arrange the columns as prescribed above for the pycnostyle, systyle, diastyle or eustyle. In araeostyles there is freedom to establish whatever spacing one wishes. In peripteral temples, however, arrange the columns so that the sides have twice as many intercolumniations as the front; the length of the work will thus be twice its breadth. Those who doubled the number of columns appear to have erred, because the length extends one intercolumniation farther than it should.

Columns are arranged on the stylobates according to the rules already established for the pycnostyle, systyle, diastyle or eustyle. In araeostyles there is greater freedom of arrangement. In peripteral temples, however, the number of intercolumniations on the sides must be twice the number on the facade, making the building twice as long as it is wide. Vitruvius considers it an error simply to double the number of columns, since this makes the length exceed the required dimension by one intercolumniation.

Upon the stylobates the columns are to be arranged as written above—whether in the pycnostyle as for pycnostyles, or in the systyle, diastyle, or eustyle as prescribed and established above. In araeostyles there is freedom to set them out as each pleases. But let the columns in peripteral temples be so placed that, however many intercolumniations there are at the front, twice as many are made on the sides; for thus the length of the work will be double its breadth. Those who doubled the number of columns seem to have erred, because one intercolumniation too many makes the length run out farther than it should.

4. Gradus in fronte constituendi ita sunt, uti sint semper inpares; namque cum dextro pede primus gradus ascendatur, item in summo templo primus erit ponendus. Crassitudines autem eorum graduum ita finiendas censeo, ut neque crassiores dextante nec tenuiores dodrante sint conlocatae; sic enim durus non erit ascensus. Retractiones autem graduum nec minus quam sesquipedales nec plus quam bipedales faciendae videntur. Item si circa aedem gradus futuri sunt, ad eundem modum fieri debent.

The steps at the front must always be odd in number: since the first step is mounted with the right foot, the same foot must be placed first at the top of the temple. I consider that the risers should be no higher than a dextans and no lower than a dodrans, that is, five-sixths and three-quarters of a foot respectively, so that the ascent is not difficult. The treads should be no less than one and a half feet and no more than two feet. Steps around the temple must be made in the same way.

The steps at the front are to be so arranged that they are always odd in number; for since the first step is mounted with the right foot, the right foot must likewise be set first upon the top of the temple. As for the thickness of these steps, I judge it should be so fixed that they be laid neither thicker than a dextans (⅚ of a foot) nor thinner than a dodrans (¾ of a foot); for thus the ascent will not be steep. The treads should be made not less than a foot and a half nor more than two feet. Likewise, if there are to be steps around the temple, they should be made in the same way.

Metrological note — III.4.4. The Spanish edition's first rendering gives the risers as nine to ten fingers, whereas its parallel rendering correctly gives dodrans and dextans as three-quarters and five-sixths of a foot. Krohn (1912, 69) and Rose (1899, 74–75) print dodrante and dextante. These are fractions of a foot, not nine and ten of the sixteen digits in a foot. Both English renderings therefore retain the checked fractions; the Spanish discrepancy is recorded here rather than reproduced as a second, incompatible prescription.

Comparative note — III.4.4–5. The requirement for an odd number of steps, so that the ascent begins and ends with the right foot, and the riser limits of a dodrans and a dextans (¾ and ⅚ of a Roman foot) belong to III.4.4. They must be distinguished from scamilli impares in III.4.5. The latter phrase is associated with a central rise of the stylobate and an optical appearance of hollowing if it is set strictly level. Its precise material interpretation remains disputed; supports, offsets and unequal leveling elements are among the reconstructions proposed. The figure promised at the end of the book is not supplied by the surviving wording. Granger, Rowland and Howe, Gros, and Corso and Romano are relevant points of comparison for the reception of the problem; their individual solutions require direct consultation. The association with

the curvature of Greek stylobates, including the Parthenon, belongs to architectural comparison and does not resolve the Latin expression by itself.

Note — III.4.4–5. The prescription of an odd number of steps belongs to the text itself and is explicitly connected with beginning and ending the ascent with the right foot. It must be distinguished from scamilli impares in the following paragraph, one of the treatise's most disputed technical passages.

5. sin autem circa aedem ex tribus lateribus podium faciendum erit, id constituatur uti quadrae spirae trunci coronae lysis ad ipsum stylobatam qui erit sub columnarum spiris conveniant. stylobatam ita oportet exaequari uti habeat per medium adiectionem per scamillos inpares. si enim ad libellam dirigetur, alveolatum oculo videbitur. hoc autem ut scamilli ad id convenientes fiant, item in extremo libro forma et demonstratio erit descripta.

If a podium is to be built around three sides of the temple, its plinths, bases, dado blocks, cornices and lysis molding must correspond to the stylobate beneath the column bases. The stylobate should be leveled with a rise at its center by means of scamilli impares; if it is set strictly level, it will appear hollow to the eye. A figure and demonstration of how the scamilli are to be adapted for this purpose will likewise be drawn at the end of the book.

Critical note — Scamilli impares. The passage's connection with the curvature or leveling of the stylobate and with optical corrections is plausible and forms part of its technical reception, but the exact material form of the scamilli has received divergent interpretations. Transmitted text, editorial conjecture and graphic reconstruction must remain typographically distinct.

Comparative textual apparatus — III.4. The chapter combines foundations, stereobatae, stylobata, steps and podium with one of the most difficult passages of the technical tradition: "scamillos inpares". The edition preserves the Latin phrase as a textual and architectural problem; it does not silently adopt a Renaissance or modern reconstruction as though it were the only possible reading.

Metrological note — Steps and podium. Numbers of steps, heights and modular relationships are retained first in their ancient formulation. Any modern decimal or metric conversion is reserved for auxiliary tables; if a figure

conflicts with a reconstruction, the textual tradition is reviewed first rather than emended for geometrical convenience.

Comparative critical apparatus — III.4. The chapter articulates foundations, stereobatae, stylobata, steps and podium. The prescription for alder, olive or oak piles charred on the surface belongs to the text itself for made ground or marshy sites. In III.4.4 the odd number of steps is explained by beginning and ending the ascent with the right foot. This rule must not be confused with the scamilli impares of III.4.5, a technical expression whose interpretation has a long editorial and architectural history. The edition keeps that distinction visible and avoids resolving the second problem by false etymology or a single reconstruction.

Architectural and textual note — Scamilli impares. The expression in III.4.5 is one of Book III's most disputed passages. It must be retained in Latin in the commentary and explained cautiously: it is connected with the stylobate's leveling or curvature and with perceptual corrections, but the material reconstructions proposed since the Renaissance are not equivalent to the textual evidence.

Chapter 5

1. His perfectis in suis locis spirae conlocentur, eaeque ad symmetriam sic perficiantur, uti crassitudo cum plintho sit columnae ex dimidia crassitudine proiecturamque, quam Graeci ἐκφοράν vocitant, habeant S extantem: ita tum lata et longa erit columnae crassitudinis unius et dimidiae.

When these parts are complete, set the column bases in position and proportion them so that their height, including the plinth, is half the column's diameter. They are to have the projection called ekphora (ἐκφορά) in Greek of [...]; their overall width and length will thus be one and a half column diameters.

Once these parts are complete, the bases (spirae) are set in position and executed according to these symmetriae: their height, including the plinth, equals half the column diameter; their projection, called ἐκφορά (ekphora) by the Greeks, is a quarter of a diameter. The total width and length of the base thus reach one and a half column diameters.

Textual and proportional note — III.5.1. The Spanish edition and Krohn's printed text (1912, 69, line 29) give S extantem; Krohn's apparatus explains S as semisse and distinguishes this editorial reading from sextantem. Rose's printed text (1899, 75) gives aeque tantam. The first authorial Spanish translation marks the quantity as [...]; the parallel architectural explanation derives a quarter-diameter projection on each side from an overall width of one and a half diameters. Both renderings are retained here and their different functions made explicit. The quarter diameter is a proportional interpretation, not a manuscript reading or a silent resolution of S extantem.

2. altitudo eius si atticurges erit, ita dividatur ut superior pars tertia parte sit crassitudinis columnae, reliquum plintho relinquatur. dempta plintho reliquum dividatur in partes quattuor fiatque superior torus quartae, reliquae tres aequaliter dividantur et una sit inferior torus, altera pars cum suis quadris scotia, quam Graeci τροχίλον dicunt.

If the base is Attic, divide its height so that the upper part is one-third of the column diameter, leaving the remainder for the plinth. Excluding the plinth, divide what remains into four parts and make the upper torus one part. Divide the other three equally between the lower torus and the scotia with its fillets, which the Greeks call trochilus (τροχίλος).

If the base is Attic, divide its height so that the part above the plinth is one-third of the column's diameter, leaving the remainder for the plinth. Excluding the plinth, divide the remaining height into four parts: one part forms the upper torus. Divide the other three parts into two equal portions, one for the lower torus and the other for the scotia and its fillets, which the Greeks call trochilus.

3. sin autem ionicae erunt faciendae, symmetriae earum sic erunt constituendae uti latitudo spirae quoqueversus sit columnae crassitudinis adiecta ⟨e⟩ crassitudine quarta et octava, altitudo ita uti atticurges, item et eius plinthos, reliquumque praeter plinthum, quod erit tertia pars crassitudinis columnae, dividatur in partes septem. inde trium partium torus qui est in summo, reliquae quattuor partes dividendae sunt aequaliter et una pars fiat cum suis astragalis et supercilio superior trochilus, altera pars inferiori trochilo relinquatur, sed inferior maior apparebit ideo quod habebit ad extremam plinthum proiecturam. astragali faciendi sunt octavae partis trochili. proiectura erit spirae pars octava et sexta decuma pars crassitudinis columnae.

But if Ionic bases are to be made, their symmetries are to be established thus: that the width of the base, in every direction, be the thickness of the column plus a quarter and an eighth of that thickness. The height, as in the Attic, and likewise its plinth; and the remainder, apart from the plinth—which will be a third of the column's thickness—let it be divided into seven parts. Of these, three for the torus that is at the top; let the remaining four be divided equally, and let one part, with its astragals and its fillet, be made the upper trochilus, and the other part left for the lower trochilus. But the lower will appear larger, because it will have its projection out to the edge of the plinth. The astragals are to be made of an eighth part of the trochilus; the projection will be an eighth plus a sixteenth of the column's diameter.

If Ionic bases are to be made, their proportions are established as follows: the base's breadth in every direction is the column diameter plus one-quarter and one-eighth of that diameter. Its height and plinth are as in the Attic base. Apart from the plinth, divide the remainder, which is one-third of the column diameter, into seven parts. Give three to the upper torus and divide the other four equally: one portion forms the upper trochilus with its astragals and fillet, while the other is reserved for the lower trochilus. The lower will appear larger,

since its projection reaches the edge of the plinth. The astragals are one-eighth of the trochilus; the projection is one-eighth of the base plus one-sixteenth of the column diameter.

Textual note — III.5.3. The running Latin and the first Spanish rendering in the Spanish edition give the projection as an eighth plus a sixteenth of the column diameter. Its parallel Spanish rendering instead says "an eighth of the base, plus a sixteenth of the column diameter". Both formulations are retained in separate English paragraphs. Krohn (1912, 70) and Rose (1899, 76) print proiectura erit spirae pars octava et sexta decuma pars crassitudinis columnae. The parallel version's different explicit referent for the eighth is an authorial interpretation, not an independently established numerical manuscript variant.

4. Spiris perfectis et conlocatis columnae sunt medianae in pronao et postico ad perpendiculum medii centri conlocandae, angulares autem quaeque e regione earum futurae sunt in lateribus aedis dextra ac sinistra, uti partes interiores, quae ad parietes cellae spectant, ad perpendiculum latus habeant conlocatum, exteriores autem partes †uti dicant se earum contracturam. Sic enim erunt figurae compositionis aedium contractura eius tali ratione exactae.

When the bases have been completed and set in place, position the central columns of the pronaos and the rear part plumb through their central axes. The corner columns and those aligned with them along the temple's right and left sides must have their inner faces, towards the cella walls, set vertically, while their outer faces †show their diminution†. In this way the forms of the temple's composition will be adjusted according to such a principle of diminution.

Once the bases are finished and set in place, the central columns of the pronaos and posticum are positioned plumb along their central axes. The corner columns and those aligned with them on the temple's right and left sides are arranged so that their inner faces, towards the cella walls, remain vertical; the diminution prescribed earlier is applied to their outer faces. In this way the adjustments to the columns' profiles are rationally integrated into the temple's composition.

5. Scapis columnarum statutis capitulorum ratio ⟨sic est habenda.⟩ si pulvinata erunt, his symmetriis conformabuntur, uti, quam crassus imus scapus fuerit addita octava decuma parte scapi, abacus habeat longitudinem et latitudinem; crassitudinem cum volutis eius dimidiam. Recedendum autem est ab extremo

abaco in interiorem partem frontibus volutarum parte duodevicensima et eius dimidia. Tunc crassitudo dividenda est in partes novem et dimidiam, et secundum abacum in quattuor partibus volutarum secundum extremi abaci quadram lineae demittendae, quae cathetoe dicuntur. Tunc ex novem partibus et dimidia una pars et dimidia abaci crassitudo relinquatur, reliquae octo volutis constituantur.

Once the column shafts have been erected, the capitals are proportioned as follows. If they are cushion capitals, the abacus must have a length and breadth equal to the lower shaft diameter plus one-eighteenth of that diameter, and its height including the volutes must be half that measure. The fronts of the volutes must be set back inwards from the edge of the abacus by one-eighteenth and half of that part. Divide the height into nine and a half parts and, in the four positions of the volutes, drop the lines called cathetoe along the outer square of the abacus. Of the nine and a half parts, reserve one and a half for the abacus's thickness and assign the remaining eight to the volutes.

The shafts of the columns being set up, the rule of the capitals will be this. If they are of the cushioned kind (pulvinata), they will be shaped by these symmetries: that the abacus have in length and breadth as much as the thickness of the lower shaft plus an eighteenth part of the shaft; its thickness, with the volutes, half of that. One must draw back from the outer edge of the abacus inward, at the fronts of the volutes, an eighteenth part and its half. Then let the thickness be divided into nine and a half parts, and, along the abacus, in the four parts of the volutes, according to the square of the abacus's edge, let the lines be dropped which are called cathetuses (κάθετοι). Of the nine and a half parts, let one and a half be reserved for the thickness of the abacus, and the remaining eight be assigned to the volutes.

Textual and numerical note — III.5.4–6. The running Latin follows the authorial Spanish edition and Krohn (1912, 70–71), retaining the crux †uti dicant se earum contracturam and the supplements ⟨sic est habenda⟩, ⟨conlocetur⟩ and ⟨schema volutae⟩. Rose (1899, 76–77) instead prints the normalized wording uti dictum ante de earum contractura, and the supplements ⟨sic erit⟩ and ⟨ponatur⟩ in the corresponding places. The literal English keeps the difficulty of III.5.4 distinct from the author's architectural paraphrase. In III.5.5 the authorial Spanish translation's first rendering says "a

nineteenth part and a half", but both printed Latin editions have duodevicensima, eighteenth, and the authorial Spanish edition's parallel explanation likewise gives eighteenth. The English therefore uses an eighteenth part plus half of that part, while recording the source's discrepancy here. No new manuscript reading is asserted.

6. Tunc ab linea, quae secundum abaci extremam partem demissa erit, in interiorem partem ⟨alia⟩ recedat unius et dimidiatae partis latitudine. Deinde hae lineae dividantur ita, ut quattuor partes et dimidia sub abaco relinquantur. Tunc in eo loco, qui locus dividit quattuor et dimidiam et tres et dimidiam partem, centrum oculi ⟨conlocetur⟩ signeturque ex eo centro rotunda circinatio tam magna in diametro, quam una pars ex octo partibus est. Ea erit oculi magnitudine, et in ea catheto respondens diametros agatur. Tunc ab summo sub abaco inceptum ⟨schema volutae⟩ in singulis tetrantorum actionibus dimidiatum oculi spatium minuatur, doneque in eundem tetrantem, qui subest, conveniat.

Then, from the line that has been dropped along the outer edge of the abacus, let another draw back inward, at a distance of one and a half parts. Let these lines then be divided so that four and a half parts remain beneath the abacus. Then, at the point that divides the four and a half from the three and a half, let the center of the eye (oculus) be placed, and from that center let a circle be described whose diameter equals one of the eight parts: that will be the size of the eye, and in it let a diameter be drawn answering to the cathetus. Then, beginning at the top, beneath the abacus, let half the space of the eye be diminished in each of the quarter-turns, until one comes back to the same quadrant that is beneath the abacus.

From the vertical line drawn beside the abacus's outer edge, take another line inwards at a distance of one and a half parts. Divide these lines so that four and a half parts remain beneath the abacus. At the point separating those four and a half parts from the remaining three and a half, establish the center of the eye (oculus). From it draw a circle with a diameter equal to one of the eight parts assigned to the volute. This is the eye's size; through its center draw the diameter coinciding with the cathetus. Beginning at the upper zone beneath the abacus, reduce the volute's construction by half the eye's diameter in each quarter-turn, until returning to the quadrant beneath the abacus.

Note — Bk. 3.5. The construction of the Ionic volute—abacus, cathetuses (κάθετοι), eye (oculus), and the reduction by quarter-turns—presupposes a diagram that Vitruvius defers 'to the end of the book' (in extremo libro), now lost in the manuscript tradition, as is that of the entasis. Its modern reconstruction relies on Fra Giocondo (1511), Cesariano (1521), and Palladio.

Technical note — III.5.5–6. Cathetus (Greek κάθετος) here denotes the vertical geometrical construction line of the volute; it should not be translated as “foot”, “leg” or other anatomical terms. Oculus is the volute’s eye. The description presupposes a graphic construction and must be translated in a way that preserves the text’s geometrical sequence, without arbitrarily completing the lost diagram.

7. capituli autem crassitudo sic est facienda ut ex novem partibus et dimidia tres partes praependeant infra astragalum summi scapi, cymatio, adempto abaco et canali, reliqua sit pars. proiectura autem cymatii habeat extra abaci quadram oculi magnitudinem. pulvinorum baltei ab abaco hanc habeant proiecturam uti circini centrum unum cum sit positum in capituli tetrante et alterum diducatur ad extremum cymatium, circumactum balteorum extremas partes tangat. axes volutarum ne crassiores sint quam oculi magnitudo, volutaeque ipsae succidantur altitudinis suae duodecimam partem. haec erunt symmetriae capitulorum, quae columnae futurae sunt ab minimo ad pedes XXV. quae supra erunt reliqua habebunt ad eundem modum symmetrias, abacus autem erit longus et latus quam crassa columna est ima adiecta parte VIIII, uti quo minus habuerit altior columna contractum, eo ne minus habeat capitulum suae symmetriae proiecturam et in latitudine suae partis adiectionem.

The capital’s height is to be proportioned so that three of its nine and a half parts hang below the astragal at the top of the shaft. After the abacus and channel have been deducted, the remainder belongs to the cymatium. The cymatium projects beyond the square of the abacus by the diameter of the volute’s eye. The bands of the cushions must project so that, with one point of the compasses placed in the capital’s quadrant and the other opened to the outer edge of the cymatium, the resulting arc touches the outermost parts of the bands. The axes of the volutes must not be thicker than the eye’s diameter, and the volutes themselves are to be cut back by one-twelfth of their height. These proportions apply to capitals on columns up to twenty-five feet high. Taller

columns retain the other proportions, but the length and width of the abacus are to equal the lower column diameter plus one-ninth, so that the smaller diminution of a taller column does not reduce the capital's appropriate projection and increase in width.

8. De volutarum descriptionibus, uti ad circinum sint recte involutae, quemadmodum describantur, in extremo libro forma et ratio earum erit subscripta. Capitulis perfectis, deinde ⟨in scapis⟩ columnarum non ad libellam sed ad aequalem modulum conlocatis, ut, quae adiectio in stylobatis facta fuerit, in superioribus membris respondeat [symmetria epistyliorum], epistyliorum ratio sic est habenda, uti, si columnae fuerint a minima XII pedum ad quindecim pedes, epistylii sit altitudo dimidia crassitudinis imae columnae; item ⟨si⟩ab XV pedibus ad XX, columnae altitudo dimetiatur in partes tredecim, et unius partis altitudo epistylii fiat; item si XX ad XXV pedes, dividatur altitudo in partes XII et semissem, et eius una pars epistylium in altitudine fiat; item si ab XXV pedibus ad XXX, dividatur in partes XII, et eius una pars altitudo fiat. Item ⟨si quae altiores erunt, ⟩ rata parte ad eundem modum ex altitudine columnarum expediendae sunt altitudines epistyliorum.

As for the drawing of the volutes, so that they may be correctly coiled to the compass, their form and method will be set down, drawn, at the end of the book.

Once the capitals have been completed and placed on the column shafts, by an equal module rather than strictly level, any rise made in the stylobates must correspond in the upper members. The architraves are proportioned as follows. For columns from twelve to fifteen feet high, the architrave's height is half the column's lower diameter. For columns from fifteen to twenty feet, divide the column's height into thirteen parts and give one part to the architrave. For columns from twenty to twenty-five feet, divide the height into twelve and a half parts and give one part to the architrave's height; for columns from twenty-five to thirty feet, divide it into twelve parts and give one part to the architrave. For taller columns, determine the architrave heights proportionally in the same manner from the column heights.

9. quo altius enim scandit oculi species, non facile persecat aeris crebritatem. dilapsa itaque altitudinis spatio et viribus exuta incertam modulorum renuntiat sensibus quantitatem. quare semper adiciendum est rationis supplementum in

symmetriarum membris, ut cum fuerint aut altioribus locis opera aut etiam ipsa colossicotera, habeant magnitudinum rationem. epistylii latitudo in imo quod supra capitulum erit quanta crassitudo summae columnae sub capitulo erit tanta fiat, summum quantum imus scapus.

The higher the line of sight rises, the less readily it penetrates the density of the air. Weakened and dispersed over the distance, it reports an uncertain perception of the modules to the senses. A proportional allowance must therefore be added to the members, so that works placed higher up, or themselves of colossal scale, retain an appropriate apparent magnitude. The architrave's width at the bottom, where it rests on the capital, is to equal the upper diameter of the column beneath the capital; at the top it is to equal the lower diameter of the shaft.

10. cymatium epistylii septima parte suae altitudinis est faciendum, et in proiectura tantundem. reliqua pars praeter cymatium dividenda est in partes XII et earum trium ima fascia est facienda, secunda IIII, summa V. item zophorus supra epistylium quarta parte minus ⟨altus⟩ quam epistylium, sin autem sigilla designari oportuerit, quarta parte altior quam epistylium, uti auctoritatem habeant scalpturae. cymatium suae altitudinis partis septimae, proiecturae cymatiûm quantum crassitudo.

The cyma of the architrave is to be made one-seventh of its height, and its projection the same. The rest, apart from the cyma, is to be divided into twelve parts: of these the lowest fascia is made of three, the second of four, and the top of five. Likewise the frieze above the architrave is one-quarter lower than the architrave; but if figures are to be carved upon it, a fourth part taller than the architrave, so that the carvings may have prominence. Its cyma is a seventh part of its own height, and the projection of the cyma as much as its thickness.

11. supra zophorum denticulus est faciendus tam altus quam epistylii media fascia, proiectura eius quantum altitudo. intersectio, quae graece μετόπη dicitur, sic est dividenda uti denticulus altitudinis suae dimidiam partem habeat in fronte, cavus autem intersectionis huius frontis e tribus duas partes, huius cymatium altitudinis eius sextam partem. corona cum suo cymatio, praeter simam, quantum media fascia epistylii, proiectura coronae cum denticulo facienda est quantum erit altitudo a zophoro ad summum coronae cymatium,

et omnino omnes ecphorae venustiorem habeant speciem quae quantum altitudinis tantundem habent proiecturae.

Above the frieze, make the dentil course as high as the middle fascia of the architrave, with its projection equal to its height. Divide the spacing, called metope (μετόπη) in Greek, so that each dentil's front width is half its height and the gap between dentils is two-thirds of that front width. Its cymatium is one-sixth of its height. The cornice, including its cymatium but excluding the sima, is to be as high as the architrave's middle fascia. The combined projection of cornice and dentils is to equal the height from the frieze to the top of the cornice's cymatium. In general, projecting members have a more graceful appearance when their projection equals their height.

12. tympani autem quod est in fastigio altitudo sic est facienda uti frons coronae ab extremis cymatiis tota dimetiatur in partes novem et ex eis una pars in medio cacumini tympani constituatur, dum contra epistylia columnarumque hypotrachelia ad perpendiculum respondeant. coronaeque supra aequaliter imis praeter simas sunt conlocandae. insuper coronas simae, quas Graeci ἐπαιετίδες dicunt, faciendae sunt altiores octava parte coronarum altitudinis. acroteria angularia tam alta quantum est tympanum medium, mediana altiora octava parte quam angularia.

To determine the height of the tympanum within the pediment, divide the entire front of the cornice, measured between the outer ends of its cymatia, into nine parts. Give one part to the height at the tympanum's central apex, while keeping its face vertically aligned with the architraves and the necks of the columns. The upper cornices are to match the lower ones, apart from the simae. Above the cornices, the simae, called epaetides in Greek, are to be one-eighth taller than the cornices. The corner acroteria are to be as high as the tympanum at its center; the central acroteria are to be one-eighth taller than the corner ones.

13. Membra omnia quae supra capitula columnarum sunt futura id est epistylia zophora coronae tympana fastigia acroteria inclinanda sunt in fronte suae cuiusque altitudinis parte XII, ideo quod cum steterimus contra frontes, ab oculo lineae duae si extensae fuerint et una tetigerit imam operis partem, altera summam, quae summam tetigerit longior fiet. ita quo longior visus linea in superiorem partem procedit, resupinatam facit eius speciem. cum autem, uti

supra scriptum est, in fronte inclinata fuerint, tunc in aspectu videbuntur esse ad perpendiculum et normam.

All members above the column capitals—architraves, friezes, cornices, tympana, pediments and acroteria—must incline forwards by one-twelfth of their respective heights. When we stand facing the facade, two lines drawn from the eye to the bottom and the top of the work have different lengths: the line reaching the top is longer. As the line of sight extends farther upwards, it makes the upper part appear to lean backwards. If the members incline forwards as prescribed, they will appear plumb and square to the viewer.

14. columnarum striae faciendae sunt XXIIII ita excavatae uti norma in cavo striae cum fuerit coniecta, circumacta anconibus ⟨angulos⟩ striarum dextra ac sinistra <> tangat cacumenque normae circum rotundationem tangendo pervagari possit. crassitudines striarum faciendae sunt quantum adiectio in media columna ex descriptione invenietur.

The columns are to have twenty-four flutes, hollowed so that a set square placed in a flute and turned has its arms touching the angles at the right and left edges, while its vertex can travel tangentially along the curve. The dimensions of the flutes are to correspond to the increase at the middle of the column as determined by the drawing.

The columns have twenty-four flutes. Hollow them so that, when a set square is inserted into a flute and turned, its arms touch the angles of the right and left edges, while its vertex can travel tangentially around the curve of the hollow. The depth or dimension of the flutes is determined according to the adiectio established for the middle of the column by the graphic construction.

Technical note — III.5.14. The passage geometrically defines a flute's profile by applying a set square to its concavity. The final sentence expressly connects the size of the flutes with the shaft's adiectio media determined ex descriptione. A general ornamental purpose not formulated in the Latin should not be added here. Once again, the loss of the figures requires distinguishing textual instruction from modern graphic reconstruction.

15. in simis quae supra coronam in lateribus sunt aedium, capita leonina sunt scalpenda, disposita ita uti contra columnas singulas primum sint designata, cetera aequali modo disposita uti singula singulis mediis tegulis respondeant. haec autem quae erunt contra columnas perterebrata sint ad canalem qui excipit

e tegulis aquam caelestem, mediana autem sint solida, uti quae cadit vis aquae per tegulas in canalem ne deiciatur per intercolumnia neque transeuntes perfundat, sed quae sunt contra columnas videantur emittere vomentia ructus aquarum ex ore. Aedium ionicarum quam apertissime potui dispositiones hoc volumine scripsi, doricarum autem et corinthiarum quae sint proportiones insequenti libro explicabo.

Carve lions' heads in the simae above the cornice along the sides of the temples. Set one opposite each column, then arrange the rest evenly, each corresponding to the center of a roof tile. Pierce those opposite the columns through to the channel that receives rainwater from the tiles; leave the intermediate ones solid, so that the water falling from the tiles into the channel does not pour down through the intercolumniations or drench passers-by. The heads opposite the columns will appear to vomit streams of water from their mouths. In this volume I have described the arrangements of Ionic temples as clearly as I could; I shall explain the proportions of Doric and Corinthian temples in the following book.

Carve lions' heads in the simae above the cornice along the sides of the temple. First place one on the axis of each column; distribute the others at equal intervals, each opposite the center of a roof tile. Pierce the heads on the column axes through to the channel receiving rainwater from the tiles; leave those between them solid, preventing water descending from the tiles into the channel from falling through the intercolumniations and soaking passers-by. Only the heads opposite the columns will thus appear to discharge streams of water from their mouths.

In the simae that are above the cornice, on the sides of the temple, lions' heads are to be carved, so arranged that first they are set opposite each of the columns, and the rest disposed at equal intervals, each answering to the middle of every tile. Those opposite the columns are to be pierced through to the channel that receives the rainwater from the tiles; but the intermediate ones are to be solid, so that the water falling through the tiles into the channel may not be poured down through the intercolumniations upon passers-by, while those opposite the columns appear to spew forth streams of water, vomiting from their mouths.

In this book I have set forth, as clearly as I could, the arrangements of Ionic temples. What the proportions of the Doric and Corinthian may be, I shall explain in the following book.

Comparative note — Book III. The English translation derives from Diego Kurilo's original Spanish text. Krohn's Latin text and the electronic transcription of Rose provide independent controls for the passages discussed in this apparatus. The Book III edition established and translated by Pierre Gros (Budé, 1990) is an essential reference, but a complete independent collation of its critical apparatus is not claimed here. No individual manuscript reading or editorial decision is attributed to Gros, Rose, Krohn or Granger without identifiable documentary support. Greek ἀναλογία in III.1.1 is the adopted technical term; a damaged electronic transcription does not by itself demonstrate corruption in the manuscript tradition.

Critical and comparative note — Conclusion of Book III. This edition's checks distinguish three levels: (1) the adopted Latin text and its transmission problems; (2) the translation, which seeks to preserve technical terminology and argumentative syntax without introducing explanations foreign to the original; and (3) the historical and architectural commentary, where modern interpretations are recorded. The Latin has been systematically compared with Krohn (Teubner, 1912) in the passages reviewed. The Budé edition of Book III, established, translated and annotated by Pierre Gros (CUF, 1990), serves as a standard of philological and archaeological rigor and, wherever a particular reading or interpretation can be documented, as an explicit point of comparison. No decisions are attributed to Gros, Rose, Krohn or other editors without verification in the relevant source.

Comparative apparatus — III.5. The Ionic order is treated as a continuous proportional sequence: spirae, column shafts, cushion capitals, volutes, epistylia, zophorus, denticuli, corona and sima. Plinths, tori, scotiae, astragals, the echinus, abacus, canalis and balteus retain their technical functions and dependence on the stated module. Supplements in the critical text remain typographically distinguishable. Discrepancies affecting height, projection, division or module take priority over merely graphic variants; conversion to modern units must not silently replace the ancient ratios.

Comparative critical apparatus — III.5. The chapter on the Ionic order is reviewed as a continuous sequence: spirae/bases → shafts → cushion capitals → volutes → epistylia → zophorus → denticuli → corona and sima. Ἐκφορά, cathetus, oculus, canalis, echinus and other terms whose modern equivalent may be only approximate are retained as technical vocabulary. Supplements marked by the critical edition—for example <sic erit> and other restored elements in the geometrical description—must remain typographically distinct from transmitted text. Proportions are checked against the lower-diameter module and are not silently converted into metric units.

Philological and graphic note — The Ionic volute. The volute's construction depends on a chain of divisions, centers and radii whose intelligibility requires text and diagram. A modern figure must reproduce the described sequence exactly and distinguish the Latin evidence from the graphic solutions proposed by editors. A numeral must not be corrected because it "looks better" in the drawing: the critical reading is determined first and the figure constructed afterwards.

Technical synthesis for architects — Book III. The book proceeds from the building's general commensurability to temple typology, from the rhythm of columns to foundations, and finally to the complete detail of the Ionic order. The common principle is that each local dimension acquires meaning through its measurable relation to the whole, but Vitruvius also introduces optical compensations: the system is not a rigid numerical grid, but a proportional discipline adjusted to construction and perception.

Comparative apparatus — III.5. The construction of the Ionic order is checked as a proportional chain: spira, columna, capitulum, epistylium, zophorus, corona and sima. The dimensions of plinth, tori, scotiae, astragals, volutes, echinus and abacus must remain dependent on the diameter or module specified by Vitruvius.

Architectural and philological note — The Ionic capital. Voluta, echinus, abacus, canal/canalis and balteus are retained as technical vocabulary. The geometrical instructions for volutes are explained step by step, but any modern diagram is identified as an editorial reconstruction rather than an autograph figure by Vitruvius.

Textual note — Numerals and fractions in III.5. Proportional sequences are passages at high risk of palaeographic and editorial corruption. The comparative apparatus therefore prioritizes discrepancies that alter a member's module, height, projection or division; purely graphic or orthographic variants are not needlessly multiplied.

Synthesis for architects — Book III. Vitruvius articulates the temple through relations between whole, members and module. The book's contemporary value lies in understanding a historical system of dimensional coordination and visual correction, not in turning its proportions into universal standards.

M. VITRVVIVS POLLIO · DE ARCHITECTVRA · LIBER IV

ARGUMENTUM LIBRI IV — *On the orders: the origin of the Corinthian capital (Callimachus), the rules of the Doric order and of the triglyphs and metopes, the arrangement of temples according to their orientation, the classes of temples according to their plan and the altars of the gods.*

Notice. — *Book IV completes the orders. It gives the aetiology of the three genera — the Doric drawn from the male body, the Ionic from the matronly, the Corinthian capital invented by Callimachus from an acanthus grown about a votive basket — and the rules of the Doric, with the famous problem of the corner triglyph. It then treats the parts of temples (cellae, doorways, the Tuscan and round temples) and closes with the orientation of altars. With Book III it forms the most influential ancient account of the classical orders.*

Preface

1. *Cum animadvertissem, imperator, plures de architectura praecepta voluminaque commentariorum non ordinata sed incepta uti particulas errabundas reliquisse, dignam et utilissimam rem putavi tantae disciplinae corpus ad perfectam ordinationem perducere et praescriptas in singulis voluminibus singulorum generum qualitates explicare. itaque, Caesar, primo volumine tibi de officio eius et quibus eruditum esse rebus architectum oporteat exposui. secundo de copiis materiae, e quibus aedificia constituuntur, disputavi. tertio autem de aedium sacrarum dispositionibus et de earum generum varietate quasque et quot habeant species earumque quae sunt in singulis generibus distributiones,*

Having observed, Emperor, that many had left the precepts and volumes of commentaries on architecture not set in order but merely begun, like scattered fragments, I judged it a worthy and most useful thing to bring the body of so great a discipline to a perfect ordering, and to set forth, in each volume, the prescribed qualities of each of the kinds. And so, Caesar, in the first book I expounded to you the office of the architect and in what subjects he ought to be trained; in the second I treated of the materials from which buildings are constructed; and in the third, of the arrangement of sacred temples, of the

variety of their kinds, how many and what species they have, and what in each kind are their distributions.

2. ex tribus generibus, quae subtilissimas haberent proportionibus modulorum quantitates, ionici generis moribus docui. nunc hoc volumine de doricis corinthiisque constitutis et omnibus dicam eorumque discrimina et proprietates explicabo.

Of the three orders that possess the most subtle proportions in the quantity of their modules, I set forth the usages of the Ionic; now, in this volume, I shall speak of the established principles of the Doric and the Corinthian, and explain their differences and properties.

Critical note — IV, preface. Non ordinata sed incepta, uti particulas errabundas characterizes earlier architectural writings polemically as scattered and unfinished materials. The difficult syntax around ex tribus generibus and ionici generis moribus should not obscure the secure program: after the Ionic, Vitruvius will examine the Doric and Corinthian systems, their differences and properties. The transmitted wording, editorial constitution, ancient aetiology and modern archaeological assessment remain distinct levels of argument.

Chapter 1

1. *1. Columnae corinthiae praeter capitula omnes symmetrias habent uti ionicae, sed capitulorum altitudines efficiunt eas pro rata excelsiores et graciliores, quod ionici capituli altitudo tertia pars est crassitudinis columnae, corinthii tota crassitudo scapi. Igitur quod duae partes e crassitudine corinthiarum adiciuntur, efficiunt excelsitate speciem earum graciliorem.*

Corinthian columns have, except for their capitals, all the symmetries of the Ionic; but the height of their capitals makes them proportionally more slender and lofty, for the height of the Ionic capital is a third part of the column's thickness, whereas that of the Corinthian equals the whole thickness of the shaft. Thus, since two thirds of the thickness are added to the height of the Corinthian, their greater loftiness gives them a more graceful aspect.

2. cetera membra quae supra columnas inponuntur aut e doricis symmetriis aut ionicis moribus in corinthiis columnis conlocantur, quod ipsum corinthium genus propriam coronarum reliquorumque ornamentorum non habuerat institutionem, sed aut e triglyphorum rationibus mutuli in coronis et epistyliis guttae dorico more disponuntur, aut ex ionicis institutis zophoroe scalpturis ornati cum denticulis et coronis distribuuntur.

The other members placed above the columns are arranged on Corinthian columns either by Doric symmetries or by Ionic usages, for the Corinthian order itself had no proper system of cornices and other ornaments: either, in the Doric manner, mutules are set in the cornices and guttae in the architraves, following the rules of the triglyphs; or, by Ionic usage, they are arranged with sculptured friezes (zophoroe), dentils, and cornices.

3. ita e generibus duobus capitulo interposito tertium genus in operibus est procreatum. e columnarum enim formationibus trium generum factae sunt nominationes, dorica, ionica, corinthia, e quibus prima et antiquitus dorica est nata. Namque Achaia Peloponnensoque tota Dorus Hellenos et Pthias nymphae filius regnavit, isque Argis vetusta civitate Iunonis templo aedificavit eius generis fortuito formae fanum, deinde isdem generibus in ceteris Achaiae civitatibus, cum etiamnum non esset symmetriarum ratio nata.

Thus, with a capital interposed between the two orders, a third order was engendered in works. For from the forms of the columns the names of the

three orders arose—Doric, Ionic, Corinthian—of which the first and most ancient is the Doric.

For Dorus, son of Hellen and the nymph Phthia, reigned over all Achaea and the Peloponnese, and at Argos, an ancient city, he built in the temple of Juno a shrine that happened to be of that order; then others of the same kind in the other cities of Achaea, when as yet the theory of the symmetries had not been born.

4. postea autem quam Athenienses ex responsis Apollinis Delphici, communi consilio totius Hellados, XIII colonias uno tempore in Asiam deduxerunt ducesque singulis coloniis constituerunt et summam imperii potestatem Ioni Xuthi et Creusae filio dederunt, quem etiam Apollo Delphis suum filium in responsis est professus, isque eas colonias in Asiam deduxit et Cariae fines occupavit ibique civitates amplissimas constituit Ephesum, Miletum, Myunta, quae olim ab aqua est devorata, cuius sacra et suffragium Milesiis Iones attribuerunt, Prienen, Samum, Teon, Colophona, Chium, Erythras, Phocaeam, Clazomenas, Lebedon, Meliten. haec Melite propter civium adrogantiam ab his civitatibus bello indicto communi consilio est sublata, cuius loco postea regis Attali et Arsinoes beneficio Zmyrnaeorum civitas inter Ionas est recepta.

Afterwards, when the Athenians, by the responses of Delphic Apollo and by the common counsel of all Hellas, led colonies at one time into Asia and appointed leaders in each colony, they gave the supreme command to Ion, son of Xuthus and Creusa, whom Apollo at Delphi had also declared his own son in his responses. He led those colonies into Asia, occupied the territories of Caria, and there founded most flourishing cities: Ephesus, Miletus, Myus—later devoured by the waters, whose rites and vote the Ionians assigned to the Milesians—Priene, Samos, Teos, Colophon, Chios, Erythrae, Phocaea, Clazomenae, Lebedos, and Melite.

5. hae civitates cum Caras et Lelegas eiecissent, eam terrae regionem a duce suo Ione appellaverunt Ioniam ibique deorum inmortalium templa constituentes coeperunt fana aedificare, et primum Apollini Panionio aedem uti viderant in Achaia constituerunt et eam Doricam appellaverunt, quod in Dorieon civitatibus primum factam eo genere viderunt

When these cities had expelled the Carians and Leleges, they called that region of the earth Ionia, after their leader Ion, and, setting up there temples to the immortal gods, began to build shrines.

And they built first a temple to Apollo Panionios, as they had seen in Achaea, and called it Doric, because they had seen it first made in that order in the cities of the Dorians.

6. in ea aede cum voluissent columnas conlocare, non habentes symmetrias earum et quaerentes quibus rationibus efficere possent uti et ad onus ferendum essent idoneae et in aspectu probatam haberent venustatem, dimensi sunt virilis pedis vestigium et id retulerunt in altitudinem. cum invenissent pedem sextam partem esse altitudinis in homine, item in columnam transtulerunt et qua crassitudine fecerunt basim scapi, tantas sex cum capitulo in altitudinem extulerunt. ita dorica columna virilis corporis proportionem et firmitatem et venustatem in aedificiis praestare coepit.

When they wished to set columns in that temple, not knowing their symmetries and seeking by what rules they might make them at once fit to bear the load and of approved beauty to the sight, they measured the print of a man's foot and referred it to the height. Finding that the foot is a sixth part of a man's height, they carried the same over to the column, and, with the thickness they gave to the base of the shaft, raised it six times that measure in height, including the capital. Thus the Doric column began to furnish in buildings the proportion, firmness, and beauty of the male body.

7. Item postea Dianae ⟨cum cogitarent⟩ constituere aedem quaerentes novi generis speciem, isdem vestigiis ad muliebrem transtulerunt gracilitatem, et fecerunt primum columnae crassitudinem altitudinis octava parte, ut haberet speciem excelsiorem. basi spiram supposuerunt pro calceo, capitulo volutas uti capillamento concrispatos cincinnos praependentes dextra ac sinistra conlocaverunt et cymatiis et encarpis pro crinibus dispositis frontes ornaverunt truncoque toto strias uti stolarum rugas matronali more demiserunt. ita duobus discriminibus columnarum inventionem, unam virili sine ornatu nuda specie, alteram muliebri subtilitate et ornatu symmetriaque sunt mutuati.

Afterwards, wishing to raise a temple to Diana in the aspect of a new order, they turned by the same footprints to feminine slenderness, and first made the thickness of the column an eighth part of its height, that it might have

a loftier look. Beneath the base they set a base-molding (spira) in place of a shoe; on the capital they placed volutes hanging to right and left like curled ringlets of hair, and adorned the fronts with cymatia and festoons (encarpi) arranged like locks; and down the whole shaft they let flutes fall like the folds of matrons' robes. Thus by two distinct criteria they took the invention of columns: one of male aspect, bare and without ornament; the other of feminine delicacy, ornament, and symmetry.

*8. posteri vero elegantia subtilitateque iudiciorum progressi et graciliorib*us *modulis delectati septem crassitudinis diametros in altitudinem columnae doricae, ionicae novem constituerunt. id autem <genus>, quod Iones fecerunt primo, Ionicum est nominatum. Tertium vero, quod Corinthium dicitur, virginalis habet gracilitatis imitationem, quod virginis propter aetatis teneritatem graciliorib*us *membris figuratae effectus recipiunt ornatus venustiores.*

The later architects, advancing in the elegance and subtlety of their judgment and delighting in more slender modules, fixed the height of the Doric column at seven diameters of the thickness, and that of the Ionic at nine. And the order which the Ionians first made was called Ionic.

The third, which is called Corinthian, imitates the slender grace of a maiden; for maidens, by reason of the tenderness of their age, figured with more slender members, receive in ornament more graceful effects.

Note — Bk. 4.1. The anthropomorphic aetiology of the orders—Doric with the proportion and firmness of the male body (foot = 1/6 of the height), Ionic with matronly slenderness and dress (volute as ringlets, flutes as the folds of the stola), Corinthian with maidenly grace—is the most influential formulation of the bond between body and architecture. On its mythic frame (Dorus, son of Hellen; Ion, son of Xuthus) see the introductory study.

9. eius autem capituli prima inventio sic memoratur esse facta. virgo civis Corinthia iam matura nuptiis inplicata morbo decessit. post sepulturam eius, quibus ea virgo viva pupulis delectabatur, nutrix collecta et composita in calatho pertulit ad monumentum et in summo conlocavit et, uti ea permanerent diutius subdiu, tegula texit. is calathus fortuito supra acanthi radicem fuerat conlocatus. interim pondere pressa radix acanthi media folia et cauliculos circum vernum tempus profudit, cuius cauliculi secundum calathi latera crescentes et ab

angulis tegulae ponderis necessitate expressi flexuras in extremas partes volutarum facere sunt coacti.

The first invention of this capital is recorded to have come about thus. A maiden, a citizen of Corinth, already of marriageable age, was carried off by illness. After her burial, her nurse gathered the little cups in which the girl had delighted while alive, arranged them in a basket (calathus), carried it to the tomb, and set it on top; and, that they might last longer in the open air, she covered it with a tile. The basket had by chance been placed over the root of an acanthus.

10. tunc Callimachus, qui propter elegantiam et subtilitatem artis marmoreae ab Atheniensibus κατατηξίτεχνος () fuerat nominatus, praeteriens hoc monumentum animadvertit eum calathum et circa foliorum nascentem teneritatem, delectatusque genere et formae novitate ad id exemplar columnas apud Corinthios fecit symmetriasque constituit, et ex eo in operis perfectionibus Corinthii generis distribuit rationes.

Meanwhile the acanthus root, pressed down by the weight, put forth about springtime leaves and little stalks through the middle; and its stalks, growing up along the sides of the basket and forced by the weight of the tile's corners, were constrained to form volutes at their ends. Then Callimachus, whom the Athenians had named katatexitechnos (κατατηξίτεχνος, 'one who refines art to the point of consuming it') for the elegance and subtlety of his work in marble, passing by this monument, noticed the basket and the tender foliage growing about it; and, delighted by the novelty of the kind and form, he made columns after that model among the Corinthians and established their symmetries, and thenceforth distributed the rules of the Corinthian order in the execution of works.

Note — Bk. 4.1.9–10. The legend of the basket (calathus) on the Corinthian maiden's tomb, wreathed by the acanthus, and of Callimachus—katatexitechnos, 'the refiner of art'—is aetiological, not historical: the Corinthian capital is attested archaeologically before Callimachus (5th c. BC), e.g. at Bassae. Vitruvius transmits the received Attic tradition. Cf. Pliny, Nat. 34.92.

11. eius autem capituli symmetria sic est facienda uti quanta fuerit crassitudo imae columnae, tanta sit altitudo capituli cum abaco. abaci latitudo ita habeat rationem ut quanta fuerit altitudo, tanta duo sint diagonia ab angulo ad

angulum spatia. ita enim iustas habebunt frontes quoquoversus latitudines. frontes sinuentur introrsus ab extremis angulis abaci suae frontis latitudinis nona. imum capituli tantam habeat crassitudinem, quantam habet summa columna praeter apothesim et astragalum. abaci crassitudo septima capituli altitudinis.

The symmetry of this capital is to be made so that its height, including the abacus, equals the thickness of the lower part of the column. Let the width of the abacus be in such proportion that its two diagonals, from angle to angle, are twice the height; for thus the fronts will have, on every side, the just width. Let the fronts be curved inward, from the outer angles of the abacus, by a ninth part of the width of their front. At its lower part let the capital have as much thickness as the upper part of the column, apart from the apothesis and the astragal. The thickness of the abacus is a seventh part of the capital's height.

12. dempta abaci crassitudine, dividatur reliqua pars in partes tres, e quibus una imo folio detur. secundum folium mediam altitudinem teneat. coliculi eandem habeant altitudinem, e quibus folia nascuntur proiecta uti excipiant quae ex coliculis natae procurrunt ad extremos angulos volutae, minoresque helices infra sinum medium qui est in abaco ⟨sub⟩ flores subiecti scalpantur. flores in quattuor partibus quanta erit abaci crassitudo tam magni formentur. ita his symmetriis corinthia capitula suas habebunt exactiones. Sunt autem quae isdem columnis inponuntur capitulorum genera variis vocabulis nominata, quorum nec proprietates symmetriarum nec columnarum genus aliud nominare possumus, sed ipsorum vocabula traducta et commutata ex corinthiis et pulvinatis et doricis videmus, quorum symmetriae sunt in novarum scalpturarum translatae subtilitatem.

The thickness of the abacus being subtracted, let the remaining part be divided into three parts, of which one is given to the lower leaf; let the second leaf occupy the middle height; let the stalks (cauliculi) have the same height, from which the projecting leaves spring that receive the volutes which, born of the stalks, run out to the extreme angles, while the smaller helices are carved within their middle—that which is on the abacus—beneath the flower. Let the flowers, on the four sides, be made as large as the thickness of the abacus. Thus, by these symmetries, the Corinthian capitals will have their due proportions.

There are also, set upon these same columns, kinds of capitals named by various terms, whose properties of symmetry we cannot set out, nor assign them to any other kind of column; but we see that their very names are borrowed and adapted from the Corinthian, the cushioned (Ionic) and the Doric, whose symmetries have been carried over into the refinement of new carvings.

Editorial note. — Chapter 1 gives the famous account of the origin of the orders and, in particular, the aetiology of the Corinthian capital. Vitruvius reads the orders anthropomorphically: the Doric drawn from the proportions of a man's body (at first six, later seven diameters high), the Ionic from a matron's slenderness — its volutes for the hair, its flutes for the folds of the robe — and the Corinthian from the slight grace of a maiden. The capital itself he ascribes to Callimachus, nicknamed by the Athenians κατατηξίτεχνος ("the refiner of his art"), who, passing the grave of a Corinthian maiden, saw an acanthus grown about a votive basket weighted by a roof-tile, its leaves curling into volutes, and made of it the new capital. The tale is legend, not history; but it embodies the Vitruvian principle that architectural form is an imitation of nature (cf. 2.1 and 4.2 on the timber origins of the stone members).

Critical and historical note — IV.1. The Corinthian column shares the Ionic column's proportions except for its capital; its upper members may follow Doric or Ionic arrangements. A rigid modern definition of a complete Corinthian order should therefore not be imposed on the passage. Dorus, Ion, the masculine and feminine analogies, and the story of the maiden's basket and acanthus belong to Vitruvius's aetiological account. Prima inventio … memoratur presents the Callimachus story as a tradition of invention rather than independently demonstrated biography.

Chapter 2

1. *Quoniam autem de generibus columnarum origines et inventiones supra sunt scriptae, non alienum mihi videtur isdem rationibus de ornamentis eorum quemadmodum sunt prognata et quibus principiis et originibus inventa dicere. in aedificiis omnibus insuper conlocatur materiatio variis vocabulis nominata. ea autem uti in nominationibus, ita in re varias habet utilitates. trabes enim supra columnas et parastaticas et antas ponuntur, in contignationibus tigna et axes. sub tectis, si maiora spatia sunt, et transtra et capreoli, si commoda, columen et cantherii prominentes ad extremam suggrundationem. supra cantherios templa, deinde insuper sub tegulas asseres ita prominentes uti parietes proiecturis eorum tegantur.*

But since the origins and inventions of the kinds of columns have been set out above, it does not seem out of place to treat in the same way of their ornaments: how they arose and from what principles and origins they derive. In every building there is set, above, a framework of timber called by various names; and this framework, just as it varies in its names, so too it varies in its uses. For the beams (*trabes*) rest upon the columns, the pilasters (*parastaticae*) and the antae; in the floor-framing are placed the joists (*tigna*) and boards; under the roofs, where the spans are larger, the cross-beams (*transtra*) and the braces (*capreoli*); where they are moderate, the ridge-beam (*columen*) and the rafters (*cantherii*) that project to the edge of the eaves (*suggrundatio*); over the rafters, the purlins (*templa*); and then, above, beneath the tiles, the laths (*asseres*) projecting so that the walls are covered by their overhang.

2. ita unaquaeque res et locum et genus et ordinem proprium tuetur. e quibus rebus et a materiatura fabrili in lapideis et marmoreis aedium sacrarum aedificationibus artifices dispositiones eorum scalpturis sunt imitati et eas inventiones persequendas putaverunt. ideo quod antiqui fabri quodam in loco aedificantes, cum ita ab interioribus parietibus ad extremas partes tigna prominentia habuissent conlocata, inter tigna struxerunt supraque coronas et fastigia venustiore specie fabrilibus operibus ornaverunt, tum proiecturas tignorum quantum eminebant ad lineam et perpendiculum parietum praesecuerunt, quae species cum invenusta îs visa esset tabellas ita formatas uti nunc fiunt triglyphi contra tignorum praecisiones in fronte fixerunt et eas cera caerulea depinxerunt ut praecisiones tignorum tectae non offenderent visum. ita

divisiones triglyphorum et ⟨met⟩oparum tignorum dispositione et intertigniûm habere in doricis operibus coeperunt.

Thus each thing keeps its own place, kind, and order. Hence, taking their model from timber carpentry, the craftsmen imitated in their carvings—in the stone and marble construction of temples—the arrangement of those members, and judged that such discoveries should be followed. For the ancient carpenters, building in a certain place, once they had set the beams (*tigna*) projecting from the inner walls out to the outermost parts, raised their structure between the beams and, above, adorned the cornices and pediments with carpentry of more graceful aspect; then they cut back the projections of the beams, as far as they jutted out, to the line and the vertical of the walls. And since that aspect seemed to them ungraceful, they fixed on the front, against the cut ends of the beams, small tablets shaped as triglyphs are now made, and painted them with blue wax, so that the cut ends of the beams, thus covered, should not offend the eye. So, imitating the divisions of the beams, they began to have in Doric works the arrangement of triglyphs and, between beam and beam, the metopes.

3. postea alii in aliis operibus ad perpendiculum triglyphorum cantherios prominentes proiecerunt eorumque proiecturas simaverunt. ex eo uti tignorum dispositionibus triglyphi, ita e cantheriorum proiecturis mutulorum sub coronis ratio est inventa. ita fere in operibus lapideis et marmoreis mutuli inclinatis scalpturis deformantur, quod imitatio est cantheriorum. etenim necessario propter stillicidia proclinati conlocantur. ergo et triglyphorum et mutulorum in doricis operibus ratio ex ea imitatione inventa est.

Afterwards others, in other works, carried the projecting rafters out to the vertical of the triglyphs and gave their projections a cyma (*sima*) profile. Hence, just as the triglyphs arose from the arrangement of the joists, so from the projections of the rafters the principle of the mutules (*mutuli*) beneath the cornices was found. Thus, generally, in works of stone and marble the mutules are carved with an inward slope, since they are an imitation of the rafters; for these are necessarily set sloping on account of the rain-drip (*stillicidia*). Therefore the principle of both the triglyphs and the mutules in Doric works was discovered from that imitation.

4. Non enim quemadmodum nonnulli errantes dixerunt fenestrarum imagines esse triglyphos ita potest esse, quod in angulis contraque tetrantes columnarum

triglyphi constituuntur, quibus in locis omnino non patitur res fenestras fieri. dissolvuntur enim angulorum in aedificiis iuncturae, si in îs fenestrarum fuerint lumina relicta. etiamque ubi nunc triglyphi constituuntur si ibi luminum spatia fuisse iudicabuntur, isdem rationibus denticuli in ionicis fenestrarum occupavisse loca videbuntur. utraque enim et inter denticulos et inter triglyphos quae sunt intervalla metopae nominantur. ὀπαι enim Graeci tignorum cubicula et asserum appellant, uti nostri ea cava columbaria. ita quod inter duas opas est intertignium, id μετόπη est apud eos nominata Ita.

For it cannot be, as some have said in error, that triglyphs are images of windows; because triglyphs are set at the corners and opposite the quarter-points (*tetrantes*) of the columns—places where it is by no means possible to make windows. For the joints at the corners of buildings would be broken apart if window-openings were left in them. And further, if it were judged that, where triglyphs now stand, there had once been openings for light, then by the same reasoning the dentils in the Ionic would be supposed to have occupied the place of windows. For in both cases the intervals—both those between the dentils and those between the triglyphs—are called metopes. For the Greeks call the sockets (*cubilia*) of the beams and of the laths ὀπαί, just as ours call those hollows *columbaria*. Thus what lies between two ὀπαί, the inter-beam space, they name μετόπη.

Comparative note — Bk. 4.2 (structural truth). Here Vitruvius states one of the most influential doctrines of architectural theory: stone ornaments are the translation—petrification—of timber roofing (triglyphs from beam-ends, mutules from rafters, dentils from laths), so that they must not represent what cannot exist in constructional reality (quod non potest in veritate fieri… non… certam rationem habere). Hence his rejection of dentils beneath mutules. The editions fix the passage without major divergence (Rose, Teubner 1899; Budé, dir. Gros); Rowland and Howe (Cambridge, 1999) stress its scope as a principle of «constructional truth». [Historical-architectural note] It is the ancient root of modern structural rationalism: Laugier's «primitive hut» (Essai sur l'architecture, 1753), Viollet-le-Duc's rationalism, and, in the twentieth century, «truth to materials» and «form follows function». Cf. the note on the angular triglyph (4.3.1–2).

5. Uti autem in doricis triglyphorum et mutulorum est inventa ratio, item in ionicis denticulorum constitutio propriam in operibus habet rationem, et quemadmodum mutuli cantheriorum proiecturae ferunt imaginem, sic in ionicis denticuli ex proiecturis asserum habent imitationem. itaque in graecis operibus nemo sub mutulo denticulos constituit. non enim possunt subtus cantherios asseres esse. quod ergo supra cantherios et templa in veritate debet esse conlocatum, id in imaginibus si infra constitutum fuerit mendosam habebit operis rationem. etiam quod antiqui non probaverunt neque instituerunt in fastigiis <mutulos aut> denticulos fieri sed puras coronas, ideo quod nec cantherii nec asseres contra fastigiorum frontes distribuuntur nec possunt prominere, sed ad stillicidia proclinati conlocantur. ita quod non potest in veritate fieri, id non putaverunt in imaginibus factum posse certam rationem habere.

And just as in the Doric the principle of triglyphs and mutules was found, so in the Ionic the disposition of the dentils has its own basis in the works; and just as the mutules reproduce the image of the projections of the rafters, so in the Ionic the dentils imitate the projections of the laths (*asseres*). For this reason, in Greek works no one sets dentils beneath mutules, since laths cannot lie beneath rafters. So what in reality must be set above the rafters and the purlin, if in the images it is placed below, will give the work a faulty design. The ancients, moreover, did not approve or establish the making of ⟨mutules or⟩ dentils on the pediments, but only plain cornices, because neither the rafters nor the laths are distributed against the fronts of the pediments, nor can they project, but are set sloping towards the drip. Thus, what cannot be done in reality, they judged could have no sound design when done in the images.

6. omnia enim certa proprietate et a veris naturae deducta moribus transduxerunt in operum perfectiones, et ea probaverunt quorum explicationes in disputationibus rationem possunt habere veritatis. itaque ex eis originibus symmetrias et proportiones uniuscuiusque generis constitutas reliquerunt. quorum ingressus persecutus de ionicis et corinthiis institutionibus supra dixi, nunc vero doricam rationem summamque eius speciem breviter exponam.

For they carried over all things into the perfection of their works with sure propriety and drawn from the true laws of nature, and they approved only those things whose explanations can uphold, in debate, the principle of truth. And so, from those origins, they left the symmetries and proportions of each kind

established. Having traced their development, I have spoken above of the Ionic and Corinthian rules; now, however, I shall briefly set out the Doric system and the general character of its appearance.

Critical and architectural note — IV.2. The sequence tigna–triglyphi, cantherii –mutuli and asseres–denticuli explains stone ornament through an ancient theory of translation from timber construction. Opas, tignorum cubicula, intertignium and metopa form a technical chain which must not be reduced to generic decoration. Vitruvius explicitly rejects the explanation of triglyphs as images of windows. His relation between veritas and imago is historically influential, but neither its aetiology nor his proposed Greek derivations independently prove the archaeological origin of every member. The supplement ⟨met⟩oparum retains its editorial status.

Chapter 3

1. *Nonnulli antiqui architecti negaverunt dorico genere aedes sacras oportere fieri, quod mendosae et disconvenientes in his symmetriae conficiebantur. itaque negavit Arcesius, item Pytheos, non minus Hermogenes. nam is cum paratam habuisset marmoris copiam in doricae aedis perfectionem, <> commutavit ex eadem copia et eam ionicam Libero Patri fecit. sed tamen non quod invenusta est species aut genus aut formae dignitas, sed quod inpedita est distributio et incommoda in opere triglyphorum et lacunariorum [distributione].*

Critical note — Bk. 4.3.1–2. The 'angular triglyph conflict' is the chief objection to the Doric in temples: the triglyph must fall at once over the column's axis and at the corner of the frieze—incompatible demands that force either the narrowing of the end intercolumniation or the distortion of the metope. Hence Arcesius, Pytheos, and Hermogenes rejected it. Vitruvius nonetheless sets out the corrected system. It is one of the classic problems of Greek architecture.

Some ancient architects denied that sacred buildings should be built in the Doric style, because they created false and inappropriate symmetries. And so Arcesius denied it, Pythius as well, and Hermogenes no less. For when he had prepared a supply of marble for the completion of the Doric building, he changed it from the same supply and made it Ionic for the Free Father. However, it is not that the species or genus or dignity of the form are unattractive, but rather that the distribution is complicated and inconvenient in the arrangement of the triglyphs and ceiling work.

2. namque necesse est triglyphos constitui contra medios tetrantes columnarum, metopasque quae inter triglyphos fient aeque longas esse quam altas. contraque in angulares columnas triglyphi in extremis partibus constituuntur et non contra medios tetrantes. ita metopae, quae proximae ad angulares triglyphos fiunt, non exeunt quadratae sed oblongiores triglyphi dimidia latitudine. at qui metopas aequales volunt facere, intercolumnia extrema contrahunt triglyphi dimidia latitudine. hoc autem sive metoparum longitudinibus sive intercolumniorum contractionibus efficietur, est mendosum. quapropter antiqui vitare visi sunt in aedibus sacris doricae symmetriae rationem.

For the triglyphs must be set opposite the middle quarter-points (*tetrantes*) of the columns, and the metopes between the triglyphs must be as long as they are

high. But at the corner columns the triglyphs are placed at the ends, not opposite the middle points; and so the metopes nearest the corner triglyphs come out not square but oblong, broader by half the width of a triglyph. Those who wish to make the metopes equal contract the outermost intercolumniations by half the width of a triglyph. But this—whether done by lengthening the metopes or by narrowing the intercolumniations—is faulty. For this reason the ancients seem to have avoided the scheme of Doric symmetry in their temples.

Explanatory note — Bk. 4.3 (the angular-triglyph problem). This is one of the most famous passages in the treatise. Vitruvius sets out the structural contradiction of the Doric order: the rule requires each triglyph to be centered on the axis of its column and every metope to be square; yet at the corners the triglyph must occupy the end of the frieze, so that the adjoining metope becomes wider —by half a triglyph's width— and ceases to be square. The two ancient remedies —widening the corner metope or contracting the outermost intercolumniation— Vitruvius calls mendosum, 'faulty.' For this awkwardness, he says, the ancients avoided the Doric order in temples; and he recalls that Hermogenes, having already prepared the marble for a Doric temple, converted it into an Ionic one dedicated to Father Bacchus (Liber Pater). The Roman solution —leaving a half-metope at the corner— allowed columns and triglyphs to be aligned once more. Collation confirms the transmitted Latin (namque necesse est triglyphos constitui contra medios tetrantes columnarum… est mendosum), with no variant affecting the sense.

Comparative note — Bk. 4.3 (angular triglyph). On the angular-triglyph problem, Gros's Budé (1992) devotes an extended commentary to the 'errors' that exegetes charge against Vitruvius, seeking to understand the logic of his choices rather than to correct them, and sets the passage within Vitruvius's polemic against the partisans of the Ionic order. Granger (Loeb) renders mendosum literally; Rowland and Howe explain the Roman half-metope solution with diagrams; Corso-Romano detail the terminology of tetrantes and metopae. This edition keeps the transmitted Latin (namque necesse est… est mendosum) unemended and translates in its own voice. The testimony of H and of the codices collated by Gros offers no variant here that alters the sense: the difficulty is doctrinal, not textual.

3. Nos autem exponimus, uti ordo postulat, quemadmodum a praeceptoribus accepimus, uti si qui voluerit his rationibus attendens ita ingredi, habeat proportiones explicatas, quibus emendatas et sine vitiis efficere possit aedium sacrarum dorico more perfectiones. frons aedis doricae in loco quo columnae constituuntur dividatur, si tetrastylos erit, in partes XXVII, si hexastylos, XXXXII. ex his pars una erit modulus, qui graece ἐμβάτης dicitur, cuius moduli constitutione ratiocinationibus efficiuntur omnis operis distributiones.

We, however, set it forth as the order of treatment requires, just as we received it from our teachers, so that anyone who wishes to proceed with attention to these rules may have the proportions laid out by which he can achieve, corrected and free of faults, the perfection of sacred buildings in the Doric manner. The front of a Doric temple, at the place where the columns are set, is divided—if it is tetrastyle—into twenty-seven parts; if hexastyle, into forty-two. One of these parts will be the module, which in Greek is called ἐμβάτης (embátes), by whose establishment all the distributions of the work are determined by calculation.

4. Crassitudo columnarum erit duorum modulorum, altitudo cum capitulo XIIII. capituli crassitudo unius moduli, latitudo duorum et moduli sextae partis. crassitudo capituli dividatur in partes tres, e quibus una plinthus cum cymatio fiat, altera echinus cum anulis, tertia hypotrachelion. contrahatur columna ita uti in tertio libro de ionicis est scriptum. epistylii altitudo unius moduli cum taenia et guttis, taenia moduli septima, guttarum longitudo sub taenia contra triglyphos alta cum regula parte sexta moduli praependeat. item epistylii latitudo ima respondeat hypotrachelio summae columnae. supra epistylium conlocandi sunt triglyphi cum suis metopis, alti unius et dimidiati moduli, lati in fronte unius moduli, ita divisi ut in angularibus columnis et in mediis contra tetrantes medios sint conlocati, et intercolumniis reliquis bini, in mediis pronao et postico terni. ita relaxatis mediis intervallis, sine inpeditionibus aditus accedentibus erit ad deorum simulacra.

The thickness of the columns will be two modules, and their height, including the capital, fourteen. The thickness of the capital is one module, and its width two and one-sixth modules. The thickness of the capital is divided into three parts: one forms the plinth with the cymatium; the second, the echinus with its annulets; the third, the hypotrachelion. The column is diminished as is written, for the Ionic, in the third book. The height of the architrave (*epistylium*) is one

module, with the taenia and the guttae; the taenia a seventh of the module; the length of the guttae, beneath the taenia and in line with the triglyphs, hangs down to the line of the taenia, and their width is a sixth of the module. Likewise the lower face of the architrave should answer to the hypotrachelion at the top of the column. Above the architrave the triglyphs are set with their metopes, one and a half modules high and one module wide at the front, so arranged that at the corner columns and the middle ones they stand opposite the middle quarter-points (*tetrantes*), with two in the remaining intercolumniations and three in the middle of the pronaos and the rear portico. Thus, with the central intervals left open, there will be unimpeded access for those approaching the images of the gods.

5. triglyphorum latitudo dividatur in partes sex, ex quibus partibus quinque in medio, duae dimidiae dextra ac sinistra designentur regula. una in medio deformetur femur, quod graece μηρός dicitur. secundum eam canaliculi ad normae cacumen inprimantur. ex ordine eorum dextra ac sinistra altera femina constituantur. in extremis partibus semicanaliculi intervertantur. triglyphis ita conlocatis, metopae quae sunt inter triglyphos aeque altae sint quam longae, item in extremis angulis hemimetopia sint inpressa dimidia moduli latitudine. ita enim erit ut omnia vitia et metoparum et intercolumniorum et lacunariorum, quod aequales divisiones factae erunt, emendentur.

The width of the triglyphs is divided into six parts, of which five are marked out in the middle, and two halves, right and left, by the rule. In the middle one thigh (*femur*) is shaped, which in Greek is called μηρός; along it the channels are cut to the point of the set-square (*norma*); on either side of them, right and left, the other thighs (*femina*) are formed; at the outer edges the half-channels are turned in. With the triglyphs thus placed, the metopes between the triglyphs should be as high as they are long; likewise at the outermost corners half-metopes are impressed, half a module wide. For thus it will come about that all the faults—of the metopes, of the intercolumniations, and of the coffers—are corrected, since the divisions will have been made equal.

6. triglyphi capitula sexta parte moduli sunt faciunda. supra triglyphorum capitula corona est conlocanda in proiectura dimidiae et sextae partis habens cymatium doricum in imo, alterum in summo. item cum cymatiis corona crassa ex dimidia moduli. dividendae autem sunt in corona ima ad perpendiculum

triglyphorum et medias metopas viarum directiones et guttarum distributiones, ita uti guttae sex in longitudinem, tres in latitudinem pateant. reliqua spatia, quod latiores sunt metopae quam triglyphi, pura relinquantur aut flumina scalpantur, ad ipsumque mentum coronae incidatur linea quae scotia dicitur. reliqua omnia, tympana simae coronae, quemadmodum supra scriptum est in ionicis, ita perficiantur.

The capitals of the triglyphs are made one-sixth of a module. Above the triglyph capitals a cornice (*corona*) is to be set, with a projection of one-half and one-sixth, having a Doric cymatium below and another above. With the cornice, then, and the cymatia, the whole cornice is to be made half a module thick. On the front of the cornice, above the triglyphs and the metopes, are distributed—plumb with the triglyphs and the centers of the metopes—the channels (*viae*) and the arrangement of the guttae, so that six guttae appear lengthwise and three across. The remaining spaces, since the metopes are wider than the triglyphs, are left plain or carved with small figures of gods. And on the very underside (*mentum*) of the cornice a line is cut which in Greek is called σκωτία (scotia). Everything else—the capitals of the columns, the architraves, the cornices—is finished as written above for the Ionic.

7. Haec ratio in operibus diastylis erit constituta. si vero systylon et monotriglyphon opus erit faciundum, frons aedis, si tetrastylos erit, dividatur in partes XVIIII S, si hexastylos erit, dividatur in partes XXVIIII S. ex his pars una erit modulus, ad quem uti supra scriptum est dividantur.

This scheme will be established for diastyle works. But if a systyle and monotriglyph work is to be made, the front of the temple, if tetrastyle, is divided into nineteen and a half parts; if hexastyle, into twenty-nine and a half. Of these, one part will be the module, by which everything is divided as written above.

8. ita supra singula epistylia et metopae et triglyphi bini erunt conlocandi, in angularibus hoc amplius dimidiatus et quantum est spatium hemitriglyphi id accedit. in mediano contra fastigium trium triglyphorum et trium metoparum spatium distabit, quo latius medium intercolumnium accedentibus ad aedem habeat laxamentum et adversus simulacra deorum aspectus dignitatem.

Thus, above each architrave side, metopes and triglyphs will be placed in pairs; at the corners, this goes further, so much so that the space of the hemiglyph is reduced by half. In the middle, against the pediment, there will be

a space of three triglyphs and three metopes, so that the wider middle of the intercolumniations will have a relief for those approaching the house and a dignity of appearance in front of the images of the gods.

9. Columnas autem striari XX striis oportet. quae si planae erunt, angulos habeant XX designatos. sin autem excavabuntur, sic est forma facienda ita uti quam magnum est intervallum striae, tam magnis striaturae paribus lateribus quadratum describatur, in medio autem quadrato circini centrum conlocetur et agatur linea rotundationis, quae quadrationis angulos tangat, et quantum erit curvaturae inter rotundationem et quadratam descriptionem, tantum ad formam excaventur. ita dorica columna sui generis striaturae habebit perfectionem.

But the columns must be fluted with 20 flutes. If they are flat, let them have 20 designated angles. But if they are to be excavated, the form will be made so that the greater the interval of the fluting, the greater the equal sides of the fluting will be, describing the square; and in the middle of the square of the circle the center is placed, and a rounding line is drawn, which touches the angles of the square, and the extension of the curvature between the rounding and the description of the square should only be excavated for the form. Thus the Doric column will have the perfection of its type of fluting.

10. de adiectione eius qua media adaugetur, uti in tertio volumine de ionicis est perscripta, ita et in his transferatur. Quoniam exterior species symmetriarum et corinthiorum et doricorum et ionicorum est perscripta, necesse est etiam interiores cellarum pronaique distributiones explicare.

As for the addition to it, whereby half is added, as is recorded in the third volume on Ionic matters, so too it is carried over in these.

Since the external appearance of the symmetrical, Corinthian, Doric and Ionic cells has been recorded, it is also necessary to explain the internal distribution of the cells and their inclinations.

Editorial note. — Chapter 3 sets out the Doric order, which, Vitruvius reports, some earlier architects had judged unfit for temples on account of its "faulty" symmetries. The difficulty is the celebrated corner-triglyph problem: each triglyph must stand over the axis of its column, yet the frieze must also close with a triglyph at the angle — two demands that cannot both be met without contracting the end intercolumniation or widening the corner metopes.

Vitruvius gives the rules (the module system, the triglyph divided into six parts, the half-metope at the corner) by which the conflict is managed; it would exercise theorists from the Hellenistic age to the Renaissance. The Doric shaft is fluted with twenty flutes, and the whole order, like the Ionic dentils, is read as the stone image of an earlier timber construction (cf. 4.2).

Critical and metrological note — IV.3. The Doric difficulty concerns the distribution of triglyphs, metopes and intercolumniations: the corner triglyph, column axis and square metope cannot all be reconciled without adjustment. Femur and μηρός here denote the vertical bands of the triglyph; a problematic form such as femina must not yield an incoherent translation as ‘women’. Modulus, tetrantes, hemitriglyphium and the series XIX S / XXIX S remain ancient dimensional expressions. The twenty flutes and the arrangement of guttae require control against the particular reconstruction, rather than decimal normalization in the Latin.

Chapter 4

1. *distribuitur autem longitudo aedis uti latitudo sit longitudinis dimidiae partis, ipsaque cella parte quarta longior sit, quam est latitudo, cum pariete, qui paries valvarum habuerit conlocationem. reliquae tres partes pronai ad antas parietum procurrant, quae antae columnarum crassitudinem habere debent. et si aedes erit latitudine maior quam pedes XX, duae columnae inter duas antas interponantur, quae disiungant pteromatos et pronai spatium. item intercolumnia tria, quae erunt inter antas et columnas, pluteis marmoreis sive ex intestino opere factis intercludantur ita uti fores habeant, per quas itinera pronao fiant.*

The length of the temple is distributed so that the width is half the length, and the cella itself is one quarter longer than it is wide, including the wall in which the doors are set. The remaining three parts run forward, for the pronaos, to the antae of the walls; these antae should have the thickness of the columns. And if the temple is more than twenty feet wide, let two columns be set between the two antae, separating the space of the surrounding colonnade (*pteroma*) from that of the pronaos. Likewise, let the three intercolumniations between the antae and the columns be closed with marble screens or panels of joinery, leaving doors in them by which one may enter the pronaos.

2. item si maior erit latitudo quam pedes XL, columnae contra regiones columnarum, quae inter antas sunt, introrsus conlocentur. et hae altitudinem habeant aeque quam quae sunt in fronte, crassitudines autem earum extenuentur his rationibus uti si octava parte erunt quae sunt in fronte, hae fiant X parte, sin autem VIIII aut decima, pro rata parte. in concluso enim aere si quae extenuatae erunt, non discernentur. sin autem videbuntur graciliores, cum exterioribus fuerint striae <XX aut> XXIIII, in his faciendae erunt XXVIII aut XXXII. ita quod detrahitur de corpore scapi, striarum numero adiecto adaugebitur ratione quo minus videatur, et ita exaequabitur dispari ratione columnarum crassitudo.

2. If the temple is more than forty feet wide, place interior columns opposite those standing between the antae. Their height should equal that of the front columns, but their diameters should be reduced: where the front columns have a diameter one-eighth of their height, the interior ones should have one-tenth; where the front proportion is one-ninth or one-tenth, reduce

the interior diameters proportionately. In an enclosed space the reduction will be less apparent. If they nevertheless seem too slender, give the interior columns twenty-eight or thirty-two flutes where the exterior columns have ⟨twenty or⟩ twenty-four. The greater number of flutes compensates visually for the reduction in the shaft, allowing columns of unequal diameters to appear equivalent.

3. hoc autem efficit ea ratio quod oculus plura et crebriora signa tangendo maiore visus circumitione pervagatur. namque si duae columnae aeque crassae lineis circummetientur, e quibus una sit non striata altera striata, et circa striglium cava et angulos striarum linea corpora tangat, tametsi columnae aeque crassae fuerint, lineae quae circumdatae erunt <non erunt> aequales, quod striarum et striglium circuitus maiorem efficit lineae longitudinem. sin autem hoc ita videbitur, non est alienum in angustis locis et in concluso spatio graciliores columnarum symmetrias in opere constituere, cum habeamus adiutricem striarum temperaturam.

This comes about because the eye, touching more numerous and frequent marks, ranges over a wider compass of vision. For if two equally thick columns are measured round with lines, one unfluted and the other fluted, and the line follows the bodies along the hollows of the flutes and the edges (*striglium*) between them, then, even though the columns are equally thick, the lines drawn around them will not be equal, because the circuit of the flutes and their channels gives the line a greater length. And if this is so, it is not out of place, in narrow places and enclosed spaces, to employ more slender proportions in the columns, since we have the tempering of the fluting to help us.

4. ipsius autem cellae parietum crassitudinem pro rata parte magnitudinis fieri oportet, dum antae eorum crassitudinibus columnarum sint aequales. et si ex structis futuri sunt, quam minutissimis caementis struantur, sin autem quadrato saxo aut marmore, maxime modicis paribusque videtur esse faciundum, quod media coagmenta medii lapides continentes firmiorem facient omnis operis perfectionem, item circum coagmenta et cubilia eminentes expressiones graphicoteran efficient in aspectu delectationem.

The thickness of the walls of the cella itself should be made in proportion to its size, provided that its antae are equal to the thickness of the columns. And if they are to be of rubble-work, let them be built with the smallest possible

aggregate; but if of squared stone or marble, it is best to use modest and equal pieces, since the middle stones, binding the central joints, will make the whole work firmer in its finish; and moreover the projecting reliefs around the joints and the beds will produce a more elegant delight to the eye.

Architectural note — IV.4. Pronaos and cella denote distinct parts of the temple and remain terminologically separate. Their proportions, the disposition of antae and columns, and the treatment of wall surfaces must be read as interdependent instructions rather than as a list of isolated modern dimensions.

Chapter 5

1. *1. Regiones autem, quas debent spectare aedes sacrae deorum inmortalium, sic erunt constituendae, uti, si nulla ratio inpedierit liberaque fuerit potestas, aedis signumque, quod erit in cella conlocatum, spectet ad vespertinam caeli regionem, uti, qui adierint ad aram immolantes aut sacrificia facientes, spectent ad partem caeli orientis et simulacrum, quod erit in aede, et ita vota suscipientes contueantur aedem et orientem caelum ipsaque simulacra videantur exaudientia contueri supplicantes et sacrificantes, quod aras omnes deorum necesse esse videatur ad orientem spectare.*

The directions faced by the temples of the immortal gods should be established as follows. If nothing prevents it and the choice is free, let the temple and the image within its cella face the western part of the sky, so that those approaching the altar to sacrifice look towards the east and the image in the temple. In taking their vows they will thus behold both the temple and the rising sky, while the images appear to listen to those praying and sacrificing. For the altars of all the gods should, it seems, face east.

2. sin autem loci natura interpellaverit, tunc convertendae sunt earum regionum constitutiones, uti quam plurima pars moenium e templis earum conspiciatur. item si secundum flumina aedis sacra fiet, ita uti Aegypto circa Nilum, ad fluminis ripas videntur spectare debere. similiter si circum vias publicas erunt aedificia deorum, ita constituantur uti praetereuntes possint respicere et in conspectu salutationes facere.

But if the nature of the site interferes, then the orientation of those regions must be changed, so that as much of the city as possible may be seen from the temples of the gods. Likewise, if sacred temples are built beside rivers—as in Egypt, around the Nile—they ought to face the river's banks. And similarly, if the buildings of the gods stand along the public roads, let them be so arranged that passers-by may see them from the front and make their salutations in full view.

Historical and ritual note — IV.5. The orientation rule is conditional. Where the site permits, the cult image and cella are arranged so that the worshipper looking towards the deity also faces east. Topography, the city, rivers and public roads can require exceptions. The orientation of the building, the image and the observer must therefore be distinguished. Archaeological diversity may

illuminate the rule's reception without turning the literary prescription into a universal account of Greek and Roman sanctuaries.

Chapter 6

1. *1. Ostiorum autem et eorum antepagmentorum in aedibus hae sunt rationes, uti primum constituatur, quot genera sint [futurae]. Genera sunt enim thyromaton haec: doricum, ionicum, atticurges. Horum ⟨dorici generis⟩ symmetriae conspiciuntur his rationibus, uti corona summa, quae supra antepagmentum superius inponitur, aeque librata sit capitulis summis columnarum, quae in pronao fuerint. Lumen autem thyretri constituatur sic, uti quae altitudo aedis a pavimento ad lacunaria fuerit, dividatur in partes tres semis et ex eis duae partes ⟨semis⟩ lumini valvarum altitudine constituantur. Haec autem dividatur in partes XII et ex eis quinque et dimidia latitudo luminis fiat in imo. Et in summo contrahatur, si erit lumen ab imo ad sedecim pedes, antepagmenti III parte; ⟨si⟩ XVI pedum ad XXV, superior pars luminis contrahatur antepagmenti parte IIII; si ab pedibus XXV ad XXX, summa pars contrahatur antepagmenti parte VIII. Reliqua, quo altiora erunt, ad perpendiculum videntur oportere conlocari.*

1. The rules for temple doors and their frames are as follows. First, the different kinds must be distinguished: Doric, Ionic and Attic. The Doric proportions follow these principles. The upper cornice above the lintel should be level with the tops of the column capitals in the pronaos. Establish the clear opening by dividing the height of the temple, from pavement to coffering, into three and a half parts, and assigning two and a half to the height of the doorway. Divide this height into twelve parts and make the lower width of the opening five and a half of them. If the opening is no more than sixteen feet high, contract it at the top by one-third of the jamb; from sixteen to twenty-five feet, by one-quarter; and from twenty-five to thirty feet, by one-eighth. Taller openings should, it seems, have vertical sides.

The symmetries of the Doric are set out thus: let the upper cornice, which rests on the top jamb, be level with the tops of the capitals of the columns in the pronaos. Let the door-opening (lumen) be fixed so that the height of the temple, from the pavement to the coffered ceiling, is divided into three parts and a half, and of these two and a half make the height of the opening for the leaves. Let this height be divided into twelve parts, and of these let five and a half form the width of the opening at the bottom; and at the top let it be drawn in: if the opening is up to sixteen feet, by a third part of the jamb; if from sixteen to

twenty-five feet, by a fourth part; if from twenty-five to thirty feet, by a seventh part. The rest, the higher they are, should be set plumb.

2. ipsa autem antepagmenta contrahantur in summo suae crassitudinis XIIII parte. supercilii crassitudo quanta antepagmentorum in summa parte erit crassitudo. cymatium faciundum est antepagmenti parte sexta, proiectura autem quanta est eius crassitudo. sculpendum est cymatium lesbium cum astragalo. supra cymatium quod erit in supercilio, conlocandum est hyperthyrum crassitudine supercilii, et in eo scalpendum est cymatium doricum, astragalum lesbium. sima scalptura corona plana cum cymatio, proiectura autem eius erit quanta altitudo. supercilii quod supra antepagmenta inponitur, dextra atque sinistra proiecturae sic sunt faciundae uti crepidines excurrant et in unguem ipso cymatio coniungantur.

Let the jambs themselves be drawn in at the top by a fourteenth part of their thickness. Let the thickness of the lintel (supercilium) equal that of the jambs at their upper part. The cyma is made a sixth part of the jamb, and its projection equal to its thickness; a Lesbian cyma with an astragal is to be carved. Above the cyma that crowns the lintel is placed the hyperthyrum, of the thickness of the lintel, and on it a Doric cyma and a Lesbian astragal are carved. At the very top a plain cornice with its cyma is carved, its projection equal to its height. Of the lintel that rests upon the jambs, the projections to right and left are so made that the fillets run out and join in a mitre with the cyma itself.

3. Sin autem ionico genere futura erunt, lumen altum ad eundem modum quemadmodum in doricis fieri videtur. latitudo constituatur ut altitudo dividatur in partes duas et dimidiam, eiusque partis unius ima luminis fiat latitudo. contracturae ita uti in doricis. crassitudo antepagmentorum ⟨ex⟩ altitudine luminis in fronte XIIII parte, cymatium huius crassitudinis sexta. reliqua pars praeter cymatium dividatur in partes XII. harum trium prima corsa fiat cum astragalo, secunda quattuor, tertia quinque, et eae aeque corsae cum astragalis circumcurrant.

3. For Ionic doors, the height of the clear opening should be determined as for Doric doors. Establish the width by dividing the height into two and a half parts and making the lower width one of them. The contractions follow the Doric rules. The face of the frame should be one-fourteenth of the opening's height, and its cyma one-sixth of that thickness. Divide the remainder,

excluding the cyma, into twelve parts: assign three to the first fascia with its astragal, four to the second and five to the third. These fasciae and their astragals should continue around the opening.

4. Hyperthyra autem ad eundem modum componantur quemadmodum in doricis. Pro crepidinibus ancones, sive parotides vocantur, excalptae dextra ac sinistra praependeant ad imi supercilii libramentum, praeter folium. Eae habeant in fronte crassitudinem ex antepagmenti tribus partibus, imo quarta parte graciliore quam superiora. Fores ita compingantur, uti scapi cardinales sint ex latitudine luminis totius XII parte. Inter duos scapos tympana ex XII partibus habeant ternas partes.

The hyperthyra are composed in the same way as in the Doric, in proportional parts. The consoles (ancones)—or parotides, as they are also called—carved to right and left, hang down to the level of the lower lintel, save for the acanthus leaf. Let them have, at the front, a thickness of two of the three parts of the jamb, and at the bottom be a fourth part more slender than above. Let the leaves (fores) be framed so that the hinge-stiles (scapi cardinales) are a twelfth part of the whole width of the opening. Between the two stiles let the panels (tympana) have three of the twelve parts.

5. inpagibus distributiones ita fient uti divisis altitudinibus in partes V duae superiori, tres inferiori designentur. super medium medii inpages conlocentur, ex reliquis alii in summo alii in imo compingantur. altitudo inpagis fiat tympani tertia parte, cymatium sexta parte inpagis. scaporum latitudines inpagis dimidia parte, item replum de inpage dimidia et sexta parte. scapi qui sunt secundum antepagmentum, dimidium inpagis constituantur. sin autem valvatae erunt, altitudines ita manebunt, in latitudinem adiciatur amplius foris latitudo. si quadriforis futura est, altitudo adiciatur.

The rails (impages) are distributed by dividing the height into five parts: two are assigned to the upper, three to the lower. Over the middle let the middle rails be set; of the rest, some are framed at the top, others at the bottom. Let the height of the rail be a third part of the panel, and its cyma a sixth of the rail. Let the width of the stiles be half the rail; the meeting-stile (replum), half plus a sixth of the rail. The stiles next to the jambs are made half the rail. But if the doors are to be folding (valvatae), the heights remain the same, and to the width is added that of another leaf; if it is to be four-leaved, height is added.

6. Atticurge autem isdem rationibus perficiuntur quibus dorica. praeterea corsae sub cymatiis in antepagmentis circumdantur, quae ita distribui debent uti antepagmenti praeter cymatium ex partibus VII habeant duas partes. ipsaque non fiunt clathrata neque bifora sed valvata, et aperturas habent in exteriores partes. Quas rationes aedium sacrarum in formationibus oporteat fieri <doricis> ionicis corinthiisque operibus, quoad potui attingere, veluti legitimis moribus exposui. nunc de tuscanicis dispositionibus quemadmodum institui oporteat dicam.

Attic doors are executed by the same rules as the Doric. Moreover, beneath the cymas, bands (corsae) are set round the jambs, which are to be so distributed that, of the seven parts of the jamb—apart from the cyma—they occupy two parts. And these doors are made neither latticed nor folding, but with leaves (valvatae), and they open outward. I have set forth, as far as I have been able, according to established usage, what rules should be followed in designing sacred temples in Doric, Ionic, and Corinthian works. Now I shall speak of how the Tuscan arrangements ought to be set out.

Note — Bk. 4.6. This chapter is the only systematic ancient source on the design of classical monumental doors. It distinguishes three kinds—Doric, Ionic, and Attic—and fixes their proportions and joinery: jambs (antepagmenta), lintel (supercilium), hyperthyron, consoles (ancones), hinge-stiles, panels (tympana), rails (impages), and leaves (valvae). A fundamental reference for reconstructing ancient doors.

I have explained, as far as I have been able, which aspects of sacred buildings should be carried out in Doric, Ionic, and Corinthian works, according to legitimate usage. I shall now speak of the Tuscan arrangements as they ought to be established.

Critical and terminological note — IV.6. Temple doors form a chain of proportions linking temple height, lumen, frame, supercilium and moldings. Antepagmenta, hyperthyrum, corsae, ancones/parotides, scapi cardinales, tympana, impages and replum are retained where a single modern joinery term would claim excessive precision. Supplements such as ⟨dorici generis⟩ remain editorial interventions. The contractions of the opening and frame are proportional data, not a modern system of graphic perspective.

Clathrata/clostrata and the difficult door terminology require an apparatus rather than silent harmonization.

Chapter 7

1. *locus, in quo aedis constituetur, cum habuerit in longitudine sex partes, una dempta reliquum quod erit latitudini detur. longitudo autem dividatur bipertito et quae pars erit interior, cellarum spatiis designetur, quae erit proxima fronti, columnarum dispositioni relinquatur.*

The place where the temple is to be raised, when it has six parts in length, one part being taken away, let the remainder be given to the breadth. Let the length be divided into two parts: the inner part be assigned to the spaces of the cellae, and that nearest the front reserved for the arrangement of the columns.

2. item latitudo dividatur in partes X. ex his ternae partes dextra ac sinistra cellis minoribus sive ibi alae futurae sunt dentur, reliquae quattuor mediae aedi attribuantur. spatium quod erit ante cellas in pronao, ita columnis designetur ut angulares contra antas, parietum extremorum e regione, conlocentur, duae mediae e regione parietum qui inter antas et mediam aedem fuerint, ita distribuantur, et inter antas et columnas priores per medium isdem regionibus alterae disponantur. eaeque sint ima crassitudine altitudinis parte VII, altitudo tertia parte latitudinis templi, summaque columna quarta parte crassitudinis imae contrahatur.

Likewise, let the breadth be divided into ten parts. Of these, three on the right and three on the left be given to the lesser cellae—or to the wings, if there be any; the remaining four, in the middle, be assigned to the temple. The space before the cellae, in the pronaos, be marked out with columns so that the corner ones stand opposite the antae, in the line of the outermost walls; the two central ones in the line of the walls that lie between the antae and the middle of the temple; and between the antae and the front columns, through the middle, let others be set in those same lines. Let these be, at the bottom, of a thickness equal to a seventh part of their height; the height a third part of the breadth of the temple; and let the top of the column be drawn in by a fourth part of the lower thickness.

3. Spirae earum altae dimidia parte crassitudinis fiant. habeant spirae earum plinthum ad circinum, altam suae crassitudinis dimidia parte, torum insuper cum apophysi crassum quantum plinthus. capituli altitudo dimidia crassitudinis. abaci latitudo quanta ima crassitudo columnae. capitulique

crassitudo dividatur in partes tres, e quibus una plintho, quae est abacus, detur, altera echino, tertia hypotrachelio cum apophysi.

Let their bases (spirae) be half as high as their thickness. Let the bases have a circular plinth, half as high as their thickness, and above it a torus with its apophyge, as thick as the plinth. The height of the capital, half the thickness. The width of the abacus, equal to the lower thickness of the column. Let the thickness of the capital be divided into three parts: one given to the plinth, which is on the abacus; another to the echinus; and the third to the hypotrachelion with its apophyge.[156]

4. Supra columnas trabes compactiles inponantur ut altitudinis modulis îs, qui a magnitudine operis postulabuntur. eaeque trabes compactiles eam habeant crassitudinem, quanta summae columnae erit hypotrachelium, et ita sint compactae subscudibus et securiclis, ut compactura duorum digitorum habeant laxationem. cum enim inter se tangunt et non spiramentum et perflatum venti recipiunt, concalefaciuntur et celeriter putrescunt.

Upon the columns let framed beams be placed, of a height in modules such as the magnitude of the work demands; and let these framed beams be so laid that they have a width equal to that of the tops of the columns, and be joined with tenons and dovetails, leaving in the joint a play of two fingers: for when they touch one another and admit no breath or draught of air, they grow hot and quickly rot.

5. supra trabes et supra parietes traiecturae mutulorum parte IIII altitudinis columnae proiciantur, item in eorum frontibus antepagmenta figantur, supraque îs tympanum fastigii structura seu de materia conlocetur. supraque eûm fastigium, columen, cantherii, templa ita sunt conlocanda ut stillicidium tecti absoluti tertiario respondeat.

Above the beams and above the walls, let the projections of the mutules jut out a fourth part of the height of the column; and on their fronts let

156 The term " **plinth**," derived from the Latin "plinthus" and, in turn, from the Greek "πλίνθος" meaning "brick," refers to the square-based molding found beneath the base of a column or pilaster, similar in shape to an abacus. This architectural element rests on the pedestal. When the pedestal extends continuously, a single plinth supports all the columns and is called a "stylobate." It is thought that its origin may be related to the stone that served as the base for the column or the wooden upright in ancient architecture.

the door-casings (antepagmenta) be fixed. Above this let the tympanum of the pediment be set, of masonry or of timber; and above it the ridge-beam (columen), the rafters (cantherii), and the purlins (templa), so arranged that the drip of the finished roof answers to a third.

Textual and architectural note — IV.7. The Latin paragraphs IV.7.3–4 prescribe the bases and capitals and then the compound timber beams; the following paragraph, on projecting mutules and the roof, is IV.7.5. The column height is one-third of the temple's width, not its height. Trabes compactiles, subscudes, securiclae, mutuli, columen, cantherii and templa are retained as technical terms where a single modern equivalent would overstate the certainty of identification. The provision of a gap between joined beams belongs to Vitruvius's explanation of ventilation and timber durability.

Note — Bk. 4.7. The only detailed ancient description of the Etrusco-Italic temple (templum tuscanicum): an almost square plan (5:6) with three cellae or one with wings, robust Tuscan columns, and a timber entablature with projecting mutules and pediment. Fundamental—with Vitr. III.3.5—for reconstructing the archaic Capitol and Italic temples; the basis of the 'Tuscan order' of Serlio and Palladio.

Comparative note — Bk. 4.7 (Tuscan temple). The description of the Tuscan temple is collated with Gros's Budé (1992), which illuminates the passage with the evidence on Italo-Etruscan temples and the plan of the archaic Capitol; Gros stresses the tension between the Greek modular norm and the Italic practice that Vitruvius seeks to reconcile. Granger (Loeb) and Rowland–Howe (Cambridge, 1999) note that this chapter is the sole ancient source for the 'Tuscan order' that Serlio (1537) and Palladio (1570) would later codify; Corso–Romano detail the vocabulary (columen, mutuli, antepagmenta). This edition translates in its own voice and keeps the transmitted text, with no variant affecting the sense here.

Editorial note. — Chapter 7 preserves the only ancient description of the Tuscan (Etruscan) temple, the native Italic type. Its proportions are broad and low: a plan nearly square, columns widely spaced and unfluted on simple bases (spirae), deep projecting eaves, and an entablature of timber rather than stone, crowned with terracotta ornaments. The plan is commonly divided to give three cellae — the arrangement of the great Capitoline temple of Jupiter, Juno and

Minerva. Because such temples were built largely of wood and terracotta, none survives entire; Vitruvius's account, with the excavated podia and the architectural terracottas, is the principal evidence for their reconstruction.

Chapter 8

1. *Fiunt autem aedes rotundae, e quibus aliae monopteroe sine cella columnatae constituuntur, aliae peripteroe dicuntur. quae sine cella fiunt, tribunal habent et ascensum ex sua diametro tertiae partis. insuper stylobatam columnae constituuntur tam altae quanta ab extremis parietibus est diametros stylobatarum, crassae altitudinis suae cum capitulis et spiris decumae partis. epistylium altum columnae crassitudinis dimidia parte. zophorum et reliqua quae insuper inponuntur, ita uti in III volumine de symmetriis scripsi.*

Round temples are also made, of which some, called monopteral, are built colonnaded without a cella, and others are called peripteral. Those made without a cella have a platform (tribunal) and an approach of stairs a third part of their diameter. Upon the stylobates columns are raised as tall as the interval between the outermost walls, and of a thickness equal to a tenth part of their height, including base and capital. The architrave (epistylium) is half the thickness of the column. The frieze (zophorus) and the rest that is set above, as I wrote in the third book on the symmetries.

Note — Bk. 4.8. The round temples—the monopteros (a colonnade without cella, with a tholos) and the circular peripteral—complete the typology. The Vitruvian description guided Renaissance and Neoclassical tholoi: Bramante's Tempietto (1502) is its direct heir. The finial (flos) crowns the conical roof of the tholos.

2. Sin autem peripteros ea aedes constituetur, duo gradus et stylobata ab imo constituantur. Deinde cellae paries conlocetur cum recessu eius a stylobata circa partem latitudinis quintam, medioque valvarum locus ad aditus relinquatur; eaque cella tantam habeat diametrum praeter parietes et circumitionem, quantam altitudinem columna. Supra stylobatam columnae circum cellam isdem symmetriis, quae ⟨supra scriptae sunt,⟩ disponantur.

2. If the temple is to be peripteral, provide two steps and the stylobate from the ground up. Set the cella wall approximately one-fifth of the width back from the stylobate, leaving an opening in the middle for the entrance. Excluding the walls and the surrounding passage, the cella's diameter should equal the height of the column. Arrange the columns around the cella on the stylobate according to the proportions already given.

3. in medio tecti ratio ita habeatur uti quanta diametros totius operis erit futura dimidia altitudo fiat tholi praeter florem, flos autem tantam habeat magnitudinem quantam habuerit columnae capitulum, praeter pyramidem. reliqua uti supra scripta sunt, isdem proportionibus atque symmetriis facienda videntur.

In the middle, let the plan of the roof be such that, whatever the diameter of the whole work is to be, half of it be the height of the tholos, apart from the finial (flos). Let the finial have as much size as the capital of the column, apart from the pyramid. The rest is to be made by the same symmetries and proportions as written above.

4. Item generibus aliis constituuntur aedes ex isdem symmetriis ordinatae et alio genere dispositiones habentes, uti est Castoris in circo Flaminio, et inter duos lucos Veiovis, item augustius Nemori Dianae columnis adiectis dextra ac sinistra ad umeros pronai. hoc autem genere primo facta est, uti est Castoris in circo Athenis in arce et in Attica Sunio Palladis Minervae. earum non aliae sed eaedem sunt proportiones. cellae enim longitudinibus duplices sunt ad latitudines uti reliquae, ex îs omnia quae solent esse in frontibus, ad latera sunt translata.

4. Other kinds of temple follow the same proportions but employ a different arrangement: for example, the temple of Castor in the Circus Flaminius, that of Vediovis between the two sacred groves, and, on a grander scale, Diana's temple in the Grove, with columns added on either side of the pronaos. The temples of Pallas Minerva on the Athenian Acropolis and at Sunium in Attica belong to the type exemplified by the temple of Castor in the Circus. Their proportions remain the same. As in the other temples, the cellae are twice as long as they are wide, but the elements normally placed at the front have been transferred to the sides.

5. nonnulli etiam de tuscanicis generibus sumentes columnarum dispositiones transferunt in corinthiorum et ionicorum operum ordinationes, et quibus in locis in pronao procurrunt antae, in isdem e regione cellae parietum columnas binas conlocantes efficiunt tuscanicorum et graecorum operum communem ratiocinationem.

5. Some builders also take the column arrangements of Tuscan temples and apply them to Corinthian and Ionic compositions. Where the antae

project into the pronaos, they place paired columns in line with the cella walls, producing a design that combines Tuscan and Greek principles.

6. alii vero removentes parietes aedis et adplicantes ad intercolumnia, pteromatos spatiis sublati efficiunt amplum laxamentum cellae, reliqua autem proportionibus et symmetriis isdem conservantes aliud genus figurae nominisque videntur pseudoperipterum procreavisse. haec autem genera propter usum sacrificiorum convertuntur. non enim omnibus diis isdem rationibus aedes sunt faciundae, quod alius alia varietate sacrorum religionum habet effectus.

6. Others move the temple walls outward to meet the intercolumniations. By eliminating the surrounding pteroma they obtain a spacious cella, while retaining the other proportions and symmetries. In doing so they seem to have created a type with a different form and name, the pseudoperipteral temple. These types vary according to sacrificial practice: temples should not be designed on the same principles for every deity, since the effect of each cult depends on its particular rites.

7. Omnes aedium sacrarum ratiocinationes uti mihi traditae sunt exposui ordinesque et symmetrias earum partitionibus distinxi, et quarum dispares sunt figurae et quibus discriminibus inter se sunt disparatae quoad potui significare scriptis exposui. nunc de aris deorum inmortalium uti aptam constitutionem habeant ad sacrificiorum rationem dicam.

I have explained all the reasoning of the sacred buildings, as they have been handed down to me, and I have distinguished their orders and symmetries by their divisions, and whose disparate figures they are, and by what distinctions they arise from one another. I explained to another, as far as I could express in writing. Now I will speak of the areas of the immortal gods, so that they may have a suitable constitution as the object of sacrifices.

Critical note — IV.8. Monopteros, peripteros, tholos, pteroma and pseudoperipterum are distinct typological terms. The chapter assembles circular and hybrid arrangements rather than a single evolutionary sequence. The examples of Castor, Vediovis and Diana are Vitruvius's exempla; modern identifications require separate documentation. His concluding uti mihi traditae sunt is methodologically significant: he presents principles as received, and differences may reflect the technical traditions available to him.

Chapter 9

1. *1. Arae spectent ad orientem et semper inferiores sint conlocatae quam simulacra, quae fuerint in aede, uti suspicientes divinitatem, qui supplicant, et sacrificent. Disparibus altitudinibus ad sui cuiusque dei decorem componantur. Altitudines autem earum sic sunt explicandae, uti Iovi omnibusque caelestibus quam excelsissimae constituantur, Vestae Terrae Matrique humiles conlocentur. Ita idoneae his institutionibus explicabuntur modulationibus ararum deformationes. Explicatis aedium sacrarum compositionibus in hoc libro, insequenti de communium operum reddemus distributionibus explicationes.*

Textual note — Book IV. The running Latin is checked against Krohn (1912), with the authorial Spanish translation controlling the English interpretation. Supplements, seclusions, alternative printed readings and the transmitted text retain distinct status. In IV.7 the full sequence of five sections must be preserved; IV.8 distinguishes monopteral, peripteral and pseudoperipteral arrangements; IV.9 reads Vestae Terrae Matrique. Historical explanations of the orders are attributed to Vitruvius and distinguished from modern archaeological reconstruction.

1. Altars should face east and always stand below the cult images within the temple, so that those who pray and sacrifice look upward towards the deity. Their heights should vary according to the decor appropriate to each god. For Jupiter and all the celestial gods, make the altars as high as possible; for Vesta, Earth and the Mother, set them low. These principles yield altar forms appropriate in their proportions.

Explanatory note — Bk. 4.9 (orientation of altars). The brief closing chapter of Book IV fixes the decorum of altars: they should face east and stand lower than the image of the god, so that the worshipper looks upward to the divinity. Vitruvius grades their height by the celestial hierarchy —very high for Jupiter and the gods of heaven; low for Vesta, Earth, and Sea (the chthonic and hearth deities)— applying to ritual the principle of decor that governs the whole treatise. The eastward orientation links the sacrifice to sunrise, a convention of Roman cult confirmed by archaeology at many sanctuaries. The text has been collated with no variant affecting the sense.

Having explained the composition of temples in this book, I shall give the rules for the arrangement of public works in the next.

Critical and religious note — IV.9. The adopted reading is Vestae Terrae Matrique, ‘Vesta, Earth and the Mother’. It sustains the contrast between the high altars of Jupiter and the celestial gods and low altars associated with terrestrial powers. Marique in another printed constitution must be recorded as an alternative reading, not silently combined with Matrique. The prescription belongs to Vitruvius’s ritual decor and does not describe every altar documented archaeologically.

M. VITRVVIVS POLLIO · DE ARCHITECTVRA · LIBER V

ARGUMENTUM LIBRI V — ON *public buildings: the forum and the basilica, the treasury, the curia and the prison; the Greek and Latin theater, its acoustics and the resonant bronze vessels; musical scales according to the theory of Aristoxenus; the porticoes, the palaestras, the ports and the shipyards.*

Notice. — Book V concerns the public buildings of the forum. It describes the forum and basilica — including the one Vitruvius himself built at Fanum Fortunae, his only documented work — the treasury, prison and senate-house, then the theater, with its harmonic theory and the bronze sounding-vessels (echea) tuned to the Greek genera. Baths, the palaestra and gymnasium, and harbors with their underwater concrete complete the book. It is a primary source for Roman urbanism, acoustics and hydraulic engineering.

Preface

1. *Qui amplioribus voluminibus, imperator, ingenii cogitationes praeceptaque explicaverunt, maximas et egregias adiecerunt suis scriptis auctoritates. quod etiam velim nostris quoque studiis res pateretur, ut amplificationibus auctoritas et in his praeceptis augeretur, sed id non est quemadmodum putatur expeditum. non enim de architectura sic scribitur uti historia aut poemata. historiae per se tenent lectores. habent enim novarum rerum varias expectationes. poematorum vero [carminum] metra et pedes ac verborum elegans dispositio et sententiarum inter personas distinctas [versuum] pronuntiatio prolectando sensus legentium perducit sine offensa ad summam scriptorum terminationem.*

2. Those who have expounded their ideas and precepts in more extensive volumes, Emperor, have lent their writings considerable distinction and authority. I too should wish the subject of our studies to permit such expansiveness, so that greater length might enhance the authority of these teachings; but this is less straightforward than one might suppose. Architecture cannot be written about in the same way as history or poetry. History holds the reader's attention through the prospect of varied new events; poetry, through its meters, rhythms, elegant arrangement of words and speeches assigned to

different characters, carries the reader's attention smoothly to the conclusion of the work.

Those who, in large volumes, explained the thoughts and precepts of their own genius, already added great and excellent authorities to their writings. Let the subject matter be permitted even in our own studies, so that authority and these precepts may be augmented by expansions; but this is not, as is supposed, convenient. Architecture is not written in the same way as history or poetry. Histories alone hold the reader's attention because they have different expectations of new things. But the meters and feet of poets' poems, the elegant arrangement of words, the distinct phrases between characters, and the pronunciation of verses, when read, guide the senses of the reader without offending the highest completion of the writings.

2. id autem in architecturae conscriptionibus non potest fieri, quod vocabula ex artis propria necessitate concepta inconsueto sermone obiciunt sensibus obscuritatem. cum ergo ea per se non sint aperta nec pateant eorum in consuetudine nomina, tum etiam praeceptorum late vagantes scripturae, si non contrahentur, ut paucis et perlucidis sententiis explicentur, frequentia multitudineque sermonis inpediente incertas legentium efficient cogitationes. itaque occultas nominationes commensusque e membris operum pronuntians, ut memoriae tradantur, breviter exponam. sic enim expeditius ea recipere poterunt mentes.

2. Architectural writing cannot achieve the same effect, because the technical vocabulary required by the art is unfamiliar and difficult for readers. If the exposition also wanders at length instead of being compressed into a few clear statements, the quantity of words will confuse their understanding. I shall therefore explain unfamiliar terms and the measured relationships of architectural members briefly, so that they can be remembered and more readily understood.

Explanatory paraphrase. Vitruvius treats brevity as a means of teaching a specialized vocabulary. A concise explanation of terms and measured relationships assists understanding and memory; obscurity is a difficulty to be addressed, not an intellectual virtue.

3. non minus cum animadvertissem distentam occupationibus civitatem publicis et privatis negotiis, paucis iudicavi scribendum, uti angusto spatio

vacuitatis ea legentes breviter percipere possent. Etiamque Pythagorae quique eius haeresim fuerunt secuti placuit cybicis rationibus praecepta in voluminibus scribere, constitueruntque cybum CCXVI versus eosque non plus tres in una conscriptione oportere esse putaverunt.

3. Seeing also that the citizens were occupied with public and private affairs, I judged that I should write briefly, so that they could grasp my subject during their limited leisure. Pythagoras and the followers of his school likewise chose to set down their precepts in books on a cubic principle: they made one cube consist of 216 verses and thought that no more than three such units should appear in a single composition.[157]

Explanatory paraphrase. The number 216 is 6^3. The passage associates a measured unit of verses with the cube's stability and with the reader's memory. It does not state that the treatise sets out a cosmological doctrine of cubic reason. That further association belongs to the author's hermeneutic proposal.

4. Cybus autem est corpus ex lateribus aequali latitudine planitiarum perquadratum. is cum est iactus, quam in partem incubuit dum est intactus inmotam habet stabilitatem, uti sunt etiam tesserae quas in alveo ludentes iaciunt. hanc autem similitudinem ex eo sumpsisse videntur quod is numerus versuum uti cybus in quemcumque sensum insederit, inmotam efficiat ibi memoriae stabilitatem. Graeci quoque poetae comici interponentes e choro canticum diviserunt spatia fabularum. ita partes cybica ratione facientes intercapedinibus levant actorum pronuntiationes.

4. A cube is a solid bounded by equal square faces. When thrown, it remains stable on whichever face it rests, provided it is left untouched, like the dice cast by players into a gaming tray. The comparison seems to have been adopted because this number of verses, once established in the mind as a cube rests on a face, would give memory a similar stability. Greek comic poets also divided their plays by inserting songs for the chorus. By organizing the parts on a cubic principle, they relieved the actors' delivery with intervals.[158]

157Vitruvius invokes cubic organization in the preface to Book V as a way of arranging a manageable body of knowledge. The interpretation of his name as an acronym developed in this work is the author's hermeneutic proposal, rather than an established etymology or an independently documented explanation of the ancient title.

Interpretive note. Vitruvius explicitly connects the cube with stability and memory. The association of 216 with a wider symbolic program is developed here as the author's hypothesis. It should be tested separately from the wording of the preface, which does not attribute this rule to Plato. Cf. Krohn (1912, 94 –95) and Rowland and Howe (1999), on the preface to Book V.

5. Cum ergo haec naturali modo sint a maioribus observata animoque advertam inusitatas et obscuras multis res esse mihi scribendas, quo facilius ad sensus legentium pervenire possint, brevibus voluminibus iudicavi scribere. ita enim expedita erunt ad intellegendum. eorumque ordinationes institui uti non sint quaerentibus separatim colligenda, sed e corpore uno et in singulis voluminibus generum haberent explicationes. itaque, Caesar, tertio et quarto volumine aedium sacrarum rationes exposui, hoc libro publicorum locorum expediam dispositiones. primumque forum uti oporteat constitui dicam, quod in eo et publicarum et privatarum rerum rationes per magistratus gubernantur.

5. Since our predecessors observed these principles in a natural way, and since I must discuss matters unfamiliar and obscure to many readers, I have chosen to write short books that make them easier to understand. I have arranged the material so that readers need not gather it from separate sources: the work forms a single body, with each book explaining a particular class of subjects. Thus, Caesar, after setting out the principles of sacred buildings in the third and fourth books, I shall explain the arrangement of public places in this one. I shall begin with the forum, where magistrates administer public and private affairs.

Explanatory paraphrase. The brief individual books form a coordinated whole. Books III and IV treated sacred buildings; Book V turns to public places and begins with the forum as the setting for civic administration.

Critical note — V, preface. Brevitas is an argument about transmitting specialized knowledge to a reader with limited time. The cube comparison supports measured and manageable writing; it is not merely incidental ornament. Technical terms that organize architectural concepts remain visible

158**Vitruvius discusses six as a perfect number in Book III, chapter 1, and invokes the Pythagorean cube of six, 216, in the preface to Book V. The two passages concern different parts of his argument: bodily and numerical proportion in the former, the measured organization of technical writing in the latter.**

even where the English is idiomatic. The obscurity acknowledged by Vitruvius does not authorize the silent simplification of his argument.

Chapter 1

1. *Graeci in quadrato amplissimis et duplicibus porticibus fora constituunt crebrisque columnis et lapideis aut marmoreis epistyliis adornant et supra ambulationes in contignationibus faciunt. Italiae vero urbibus non eadem est ratione faciendum, ideo quod a maioribus consuetudo tradita est gladiatoria munera in foro dari.*

The Greeks raised large double porticoes in the agora and adorned them with closely set columns and with epistyles of stone or marble, and above they made walkways over the floors. But in the cities of Italy this should not be done in the same way, because it is a custom handed down by the ancestors to give gladiatorial shows in the forum.

2. igitur circum spectacula spatiosiora intercolumnia distribuantur circaque in porticibus argentariae tabernae maenianaque superioribus coaxationibus conlocentur, quae et ad usum et ad vectigalia publica recte erunt disposita. Magnitudines autem ad copiam hominum oportet fieri, ne parvum spatium sit ad usum aut ne propter inopiam populi vastum forum videatur. latitudo autem ita finiatur uti longitudo in tres partes cum divisa fuerit, ex his duae partes ei dentur. ita enim erit oblonga eius formatio et ad spectaculorum rationem utilis dispositio.

Therefore the spaces between the columns around the area used for spectacles should be wider. Bankers' shops should be arranged in the surrounding porticoes, with viewing galleries on the upper floors, so that the whole serves its intended uses and provides public revenue.

The forum must be proportioned to the number of inhabitants: it should offer sufficient space without appearing deserted in a small community. Its width should be two-thirds of its length, producing an oblong plan suited to public spectacles.

3. columnae superiores quarta parte minores quam inferiores sunt constituendae, propterea quod oneri ferendo quae sunt inferiora firmiora debent esse quam superiora, non minus quod etiam nascentium oportet imitari naturam, ut in arboribus teretibus, abiete cupresso pinu, e quibus nulla non crassior est ab radicibus, dein decrescendo progreditur in altitudinem naturali contractura peraequata nascens ad cacumen. ergo si natura nascentium ita postulat, recte est

constitutum et altitudinibus et crassitudinibus superiora inferiorum fieri contractiora.

The upper columns should be one-quarter smaller than the lower ones. The members carrying the load below must be stronger, and the arrangement should also follow the growth of trees: fir, cypress and pine are thicker at the roots and narrow naturally toward the top. Since this is the pattern of growth, the upper members are appropriately reduced in both height and thickness.

4. Basilicarum loca adiuncta foris quam calidissimis partibus oportet constitui, ut per hiemem sine molestia tempestatium se conferre in eas negotiatores possint. Earumque latitudines ne minus quam ex tertia, ne plus ex dimidia longitudinis constituantur, nisi si loci natura inpedierit et aliter coegerit symmetriam commutari. Sin autem locus erit amplior in longitudine, chalcidica in extremis constituantur, uti sunt in Iulia Aquiliana.

The sites of the basilicas, adjoined to the fora, should be established on the warmest sides, so that in winter the merchants may resort to them without the annoyance of storms. Their widths should be set at no less than a third and no more than half of their length, unless the nature of the site prevents it and compels the symmetry to be otherwise altered. But if the site is more ample in length, let chalcidica be placed at the ends, as they are in the Julia Aquiliana.

5. Columnae basilicarum tam altae, quam porticus latae fuerint, faciendae videntur; porticus, quam medium spatium futurum est, ex tertia finiatur. Columnae superiores minores quam inferiores, uti supra scriptum est, constituantur. Pluteum, quod fuerit inter superiores et inferiores columnas, item quarta parte minus, quam superiores columnae fuerint, oportere fieri videtur, uti supra basilicae contignationem ambulantes ab negotiatoribus ne conspiciantur. Epistylia, zophora, coronae ex symmetriis columnarum, uti in tertio libro diximus, explicentur.

The columns of the basilicas appear to be as tall as the width of the portico; the gallery, which will be the space in between, should be completed from the third level. The upper columns should be smaller than the lower ones, as described above. The shelf, which was between the upper and lower columns, also a quarter shorter than the upper columns, seems to have been necessary so as not to be seen by the merchants walking on the basilica floor. The architraves

(epistylia), friezes (zophora), and cornices are set out according to the symmetries of the columns, as we said in the third book.

6. Non minus summam dignitatem et venustatem possunt habere comparationes basilicarum quo genere Coloniae Iuliae Fanestri conlocavi curavique faciendam, cuius proportiones et symmetriae sic sunt constitutae. mediana testudo inter columnas est longa pedes CXX, lata pedes LX. porticus eius circa testudinem inter parietes et columnas lata pedes XX. columnae altitudinibus perpetuis cum capitulis pedes L, crassitudinibus quinûm, habentes post se parastaticas altas pedes XX, latas pedes II S, crassas I S, quae sustinent trabes in quibus invehuntur porticuum contignationes. supraque eas aliae parastaticae pedum XVIII, latae binûm, crassae pedem, quae excipiunt item trabes sustinentes cantherium et porticûm, quae sunt summissa infra testudinem, tecta.

6. No less can comparisons of the basilicas of the kind I have placed and taken care to build in the Colonia Julia Fanestri, the proportions and symmetries of which are thus established. The central hall (testudo) between the columns is 120 feet long, 60 feet wide. Its portico around the dome between the walls and columns is 20 feet wide. The columns are of continuous heights with capitals of 50 feet, five feet thick, having behind them parastatics 20 feet high, 25 feet wide, and 15 feet thick, which support the beams on which the floors of the porticoes are carried. And above them other parastatics 18 feet, two feet wide, and a foot thick, which also accommodate the beams supporting the cantherium and the roofs of the porticoes, which are lowered below the dome.

Designs of no less dignity and beauty can be achieved in basilicas — of which kind I myself designed and supervised the building (*conlocavi curavique*) at the Colonia Iulia Fanestris, whose proportions and symmetries were established as follows. The central vaulted nave (*testudo*), between the columns, is one hundred and twenty feet long and sixty wide. Its surrounding portico, between the walls and the columns, is twenty feet wide. The columns, in continuous height including their capitals, are fifty feet, with a thickness of five; behind them stand pilasters (*parastaticae*) twenty feet high, two and a half wide and one and a half thick, which support the beams that carry the floors of the porticoes. And above these are other pilasters eighteen feet high, two wide and

one thick, which in turn receive the beams that bear the rafters (*cantherium*) and the roofs of the porticoes, set below the level of the central nave.

7. reliqua spatia inter parastaticarum et columnarum trabes per intercolumnia luminibus sunt relicta. columnae sunt in latitudine testudinis cum angularibus dextra ac sinistra quaternae, in longitudine quae est foro proxima cum isdem angularibus octo, ex altera parte cum angularibus VI, ideo quod mediae duae in ea parte non sunt positae ne inpediant aspectus pronai aedis Augusti, quae est in medio latere parietis basilicae conlocata spectans medium forum et aedem Iovis,

The remaining spaces, between the beams of the pilasters and those of the columns, are left open through the intercolumniations to admit light. Across the width of the nave (*testudo*) the columns are four on each side, counting the corner ones, right and left; along the long side nearest the forum, eight with the same corner columns; and on the other side, six, because the two central columns were not set on that side, so as not to block the view of the pronaos of the temple of Augustus, which stands in the middle of the basilica's side wall, facing the center of the forum and the temple of Jupiter.

8. item tribunal quod est in ea aede hemicycli schematis minoris curvatura formatum. eius autem hemicycli in fronte est intervallum pedes XLVI, introrsus curvatura pedes XV, uti qui apud magistratus starent negotiantes in basilica ne inpedirent. supra columnas ex tribus tignis bipedalibus compactis trabes sunt circa conlocatae. eaeque ab tertiis columnis quae sunt in interiore parte reverteruntur ad antas quae a pronao procurrunt dextraque et sinistra hemicyclium tangunt.

Likewise, the tribunal in that hall is formed with the curvature of a hemicycle of a lesser segment. The front of this hemicycle is forty-six feet across, and its curvature inward fifteen feet, so that those who stood before the magistrates might not obstruct those doing business in the basilica. Above the columns, beams made of three two-foot timbers joined together are placed around; and these, from the third columns which are on the inner side, return to the antae that run forward from the pronaos and touch the hemicycle on the right and left.

Likewise, the tribunal (*tribunal*) in that same hall is shaped as a hemicycle: its front spans forty-six feet and its inward curve fifteen, so that those appearing

before the magistrates would not impede those doing business in the basilica. Above the columns, on the inner side, beams made of three two-foot timbers joined together turn back towards the antae that project from the pronaos and meet the hemicycle on the right and left.

9. supra trabes contra capitula ex fulmentis dispositae pilae sunt conlocatae altae pedes III, latae quoqueversus quaternis. supra eas ex duobus tignis bipedalibus trabes everganeae circa sunt conlocatae. quibus insuper transtra cum capreolis columnarum contra corpora et antas et parietes pronai conlocata sustinent unum culmen perpetuae basilicae, alterum a medio supra pronaum aedis.

Above the beams, opposite the capitals and set upon brackets, piers (*pilae*) are placed, three feet high and four feet wide each way. Upon these, made of two two-foot timbers, beams are laid running round about. And upon these, the cross-beams with the struts (*capreoli*) of the columns, set against the shafts, the antae and the walls of the pronaos, support two ridge-beams: one running the whole length of the basilica, the other rising from the center over the pronaos of the temple.

10. ita fastigiorum duplex pectinata dispositio extrinsecus tecti et interioris altae testudinis praestat speciem venustam. item sublata epistyliorum ornamenta et pluteorum columnarumque superiorum distributio operosam detrahit molestiam sumptusque inminuit ex magna parte summam. ipsae vero columnae in altitudine perpetua sub trabes testudinis perductae et magnificentiam inpensae et auctoritatem operi adaugere videntur.

Thus the double arrangement of the roof-pediments, so produced, presents a beautiful appearance both on the exterior of the roof and within the high vaulted nave (testudo). Moreover, the omission of the ornaments of the architraves (epistylia), together with the arrangement of the parapets (plutei) and the upper columns, removes laborious work and greatly reduces the total cost. And the columns themselves, carried up in continuous height to the beams of the vault, seem to add magnificence to the outlay and authority to the work.

Critical note — Bk. 5.1.6–10 (Basilica at Fano). This is the only building Vitruvius declares he himself designed and superintended (conlocavi curavique), in the Colonia Iulia Fanestris (Fano). The passage was corrupt and is here restored after Rose: in 5.1.10, 'tecti nata dispositio' (not 'T uti notae'); in

5.1.8 two phrases lost by haplography are restored, 'hemicycli schematis minoris curvatura formatum. eius autem hemicycli' and 'circa conlocatae. eaeque ab tertiis columnis quae sunt'. The reading 'in the shape of a T', current in modern translations, derives from that corruption, though it aptly describes the actual plan (nave + transverse temple of Augustus). The archaeological discovery at Fano (2026) allows the Vitruvian measurements (testudo 120×60 feet; columns of 50 feet) to be checked for the first time; see Appendix S.

Comparative note — Bk. 5.1.6–10 (Basilica at Fano). In the Budé series, Book V is the work of Catherine Saliou (Les Belles Lettres, 2009), the volume that completes the collection and argues each difficult reading, weighing the alternatives before deciding; her commentary on the forensic basilica is fundamental. Granger (Loeb) and Rowland–Howe (Cambridge, 1999) transmit the 'T-shaped' description which, as the critical note observes, derives from the corruption T uti notae; Tavernor and Schofield (Penguin, 2009) accompany their version with reconstructions. This edition restores the text after Rose and translates in its own voice. What is new with respect to the whole editorial tradition is the comparison with the archaeological discovery at Fano (2026), treated as preliminary evidence: for the first time the Vitruvian measurements (a testudo of 120×60 feet, columns of 50 feet) can be checked against material remains; see Appendix S.

Editorial note. — In 5.1.6–10 Vitruvius describes the basilica he himself designed and supervised at the Colonia Iulia Fanestris (modern Fano) — the one building he explicitly claims as his own work (conlocavi curavique). He departs from the usual plan: the columns rise the full height of the hall (testudo), the aisle running round them; the tribunal is set in a hemicycle forty-six feet across; and a double arrangement of pediments crowns roof and interior. The passage is therefore doubly valuable — as the only first-hand account of a Vitruvian design and as a control on his theory put into practice. On the proposed identification with the 2026 excavations in Piazza Andrea Costa, treated as provisional, see the Theses (no. 7).

Critical and metrological note — V.1. The forum is distinguished from the Greek agora, and the basilica's placement is related to seasonal use. At Fanum Fortunae, conlocavi curavique faciendam states Vitruvius's responsibility for design and supervision. The central space of 120 × 60 Roman feet, the twenty-

foot portico and columns fifty feet high and five in diameter remain primary textual data. Testudo, porticus and parastaticae require explanatory translation. Excavation may inform a reconstruction, but neither a compatible ground plan nor institutional identification replaces the textual apparatus or establishes every architectural detail.

Chapter 2

1. *Aerarium, carcer, curia foro sunt coniungenda, sed ita uti magnitudo ⟨ac⟩ symmetriae eorum foro respondeant. maxime quidem curia in primis est facienda ad dignitatem municipii sive civitatis. et si quadrata erit, quantum habuerit latitudinis dimidia addita constituatur altitudo, sin autem oblonga fuerit, longitudo et latitudo componatur et summae compositae, eius dimidia pars sub lacunariis altitudini detur.*

The treasury, the prison, and the senate-house (curia) should adjoin the forum, but so that the magnitude of their symmetry answers to the forum. Above all the curia is to be built in keeping with the dignity of the municipality or city. If it is square, let its height be established by adding to its width the half of that width; but if it is oblong, let its length and width be added together, and of that total sum let the half be given to the height, up to the coffered ceiling.

2. praeterea praecingendi sunt parietes medii coronis ex intestino opere aut albario ad dimidiam partem altitudinis. quae si non erunt, vox ibi disputantium elata in altitudinem intellectui non poterit esse audientibus. cum autem coronis praecincti parietes erunt, vox ab imis, morata priusquam in aera elata dissipabitur, auribus erit intellecta.

Furthermore, the walls are to be girded at mid-height by cornices of joinery (intestinum opus) or of stucco (albarium). For if these are lacking, the voice of those debating, rising into the height, cannot be understood by the listeners. But when the walls are girded with cornices, the voice, held back from below before it rises into the air and is dissipated, will be understood by the ears.

Critical and acoustic note — V.2. Aerarium, carcer and curia are related to the forum through dimensional correspondence. The curia's height depends on whether its plan is square or oblong. Intestinum opus and albarium distinguish interior finishing or joinery from stucco work. The continuous cornice at mid-height is explained by Vitruvius as restraining the upward dispersal of the voice. Modern concepts of reflection, absorption or reverberation may assist comparison, but are not quantities measured in the ancient text.

Chapter 3

1. *Cum forum constitutum fuerit, tum deorum inmortalium diebus festis ludorum spectationibus eligendus est locus theatro quam saluberrimus, uti in primo libro de salubritatibus in moenium conlocationibus est scriptum. per ludos enim cum coniugibus et liberis persedentes delectationibus detinentur et corpora propter voluptatem inmota patentes habent venas, in quas insidunt aurarum flatus, qui si a regionibus palustribus aut aliis regionibus vitiosis advenient, nocentes spiritus corporibus infundent. itaque si curiosius eligetur locus theatro, vitabuntur vitia.*

Once the forum was established, then, in anticipation of the festivals of the immortal gods, a place as wholesome as possible should be chosen for the theater, as is written in the first book concerning the healthfulness of settlements within the walls. For during the games, those who sit with their wives and children are seized by pleasure, and their bodies are immobile because of it, and their veins are open, through which gusts of wind enter, which, if they come from marshy or other vicious regions, infuse their bodies with harmful spirits. Therefore, if the place for the theater is chosen with greater care, defects will be avoided.

2. etiamque providendum est ne impetus habeat a meridie. sol enim cum implet eius rotunditatem, aer conclusus curvatura neque habens potestatem vagandi versando confervescit et candens adurit excoquitque et inminuit e corporibus umores. ideo maxime vitandae sunt his rebus vitiosae regiones et eligendae salubres.

Care must also be taken that the hall does not receive the southern exposure. For when the sun fills the chamber with its heat, the air enclosed in the vault, having no way to circulate, boils and consumes with its vapor the sturdy parts of the bodies.

3. fundamentorum autem, si in montibus fuerint, facilior erit ratio, sed si necessitas coegerit in plano aut palustri loco ea constitui, solidationes substructionesque ita erunt faciendae, quemadmodum de fundationibus aedium sacrarum in tertio libro est scriptum. insuper fundamenta lapideis et marmoreis copiis gradationes ab substructione fieri debent.

But the arrangement of the foundations, if they are in the mountains, will be easier; but if necessity compels them to be established on a plain or in a marshy place, the consolidations and substructures will be made in the same way as is written about the foundations of the sacred buildings in the third book. Moreover, the foundations must be of stone and the steps of marble for the substructure.

4. praecinctiones ad altitudines theatrorum pro rata parte faciendae videntur, neque altiores quam quanta praecinctionis itineris sit latitudo. si enim excelsiores fuerint, repellent et eicient e superiore parte vocem nec patientur in sedibus suis, quae sunt supra praecinctiones, verborum casus certa significatione ad aures pervenire. et ad summam ita est gubernandum uti linea cum ad imum gradum et ad summum extenta fuerit, omnia cacumina graduum angulosque tangat. ita vox non inpedietur.

The praecinctiones (belts) should be made in proportion to the height of the theaters, and no higher than the width of the passage of the praecinctio; for if they were too high, they would drive the voice upward and would not let the endings of words reach with clarity the ears of those seated above the praecinctiones. In sum, it must be so governed that, when a line is drawn from the lowest step to the highest, it touches all the summits and angles of the steps: thus the voice will not be hindered.

5. aditus complures et spatiosos oportet disponere, nec coniunctos superiores inferioribus sed ex omnibus locis perpetuos et directos sine inversuris faciendos, uti cum populus dimittatur de spectaculis, ne comprimatur, sed habeat ex omnibus locis exitus separatos sine inpeditione. Etiam diligenter est animadvertendum ne sit locus surdus, sed ut in eo vox quam clarissime vagari possit. hoc vero fieri ita poterit, si locus electus fuerit ubi non inpediatur resonantia.

It is necessary to provide several spacious entrances, and not to connect the upper and lower ones, but to make them continuous and direct from all areas without any obstacles, so that when people leave the performances, they should not be cramped, but have separate exits from all areas without obstruction. Care must also be taken to ensure that it is not a soundproof space, but that the voice can travel through it as clearly as possible. This can only be achieved if a location has been chosen where echoes are not lingering.

6. vox autem est spiritus fluens aeris, e tactu sensibilis auditu. ea movetur circulorum rotundationibus infinitis, uti si in stantem aquam lapide inmisso nascantur innumerabiles undarum circuli crescentes, a centro quam latissime possint et vagantes, nisi angustia loci interpellaverit aut aliqua offensio quae non patitur designationes earum undarum ad exitus pervenire. itaque cum interpellentur offensionibus, primae redundantes insequentium disturbant designationes.

But the voice is like a flowing breath of air, and it is truly perceptible to the ear. It moves through the endless roar of the circles, as if a stone were thrown into stagnant water; countless circles of waves are born, growing from the center as wide as they can, and wandering, unless the narrowness of the place interrupts them or some offense prevents the designs of these waves from reaching their outlet. And so, when they are interrupted by offenses, the first overflow of the following ones disturbs their designs.

7. eadem ratione vox item ad circinum efficit motiones, sed in aqua circuli planitiae in latitudine moventur, vox et in latitudine progreditur et altitudinem gradatim scandit. igitur ut in aqua undarum designationibus, item in voce cum offensio nulla primam undam interpellaverit, non disturbat secundam nec insequentes, sed omnes sine resonantia perveniunt ad imorum et ad summorum aures.

In the same way, the voice makes its movements as if traced by a compass (ad circinum). But whereas in water the circles move in breadth over the flat surface, the voice advances at once in breadth and ascends gradually in height. Therefore, as with the waves on the surface of water, so with the voice: when the first wave meets no obstacle, it does not impede the second or the third, but all reach, without resonance, the ears of those below and those above.

8. ergo veteres architecti naturae vestigia persecuti indagationibus vocis scandentis theatrorum perfecerunt gradationes, et quaesierunt per canonicam mathematicorum et musicam rationem ut quaecumque vox esset in scaena, clarior et suavior ad spectatorum perveniret aures. uti enim organa aeneis lamminis aut corneis ἠχεῖα ad chordarum sonitûm claritatem perficiuntur, sic theatrorum per harmonicen ad augendam vocem ratiocinationes ab antiquis sunt constitutae.

Therefore, the ancient architects, following the steps of nature, investigating the rising sound of theaters, completed the gradations, and sought, through the canonical method of mathematics and music, that whatever voice was on the stage, it should reach the ears of the spectators in a clear and sweet manner. For just as organs are made of brass plates or ox horns for the clarity of the heart's sound, so the ancients established the reasoning of theaters to augment the voice through harmonics.

Critical note — V.3. The theater's healthy site, avoidance of southern exposure and cavea slope belong to Vitruvius's environmental and medical framework. He distinguishes the horizontal and upward propagation of vox and seeks to avoid obstructions that impair intelligibility. A modern account of waves or the acoustic field remains commentary rather than a replacement for his ancient explanation.

Chapter 4

1. *Harmonice autem est musica litteratura obscura et difficilis, maxime quidem quibus graecae litterae non sunt notae. quam si volumus explicare, necesse est etiam graecis verbis uti, quod nonnulla eorum latinas non habent appellationes. itaque ut potuero quam apertissime ex Aristoxeni scripturis interpretabor et eius diagramma subscribam finitionesque sonituum designabo, uti qui diligentius attenderit facilius percipere possit.*

Harmonic theory is a difficult and obscure branch of learning, especially for those unfamiliar with Greek. To explain it, we must use Greek terms, since some have no Latin equivalents. I shall therefore interpret the writings of Aristoxenus as clearly as I can and set out his diagram and the limits of the notes, so that attentive readers may understand them more readily.

2. vox enim mutationibus cum flectitur alias fit acuta alias gravis, duobusque modis movetur, e quibus unus effectus habet continuatos, alter distantes. continuata vox neque in finitionibus consistit neque in loco ullo, efficitque terminationes non apparentes, intervalla autem media apparentia, uti sermone cum dicamus sol lux flos vox. nunc enim nec unde incipit nec ubi desinit intellegitur, sed quod ex acuta facta est gravis et ex gravi acuta, apparet auribus. per distantiam autem e contrario. namque cum flectitur inmutatione vox statuit se in alicuius sonitus finitione, deinde in alterius, et id ultro citro crebre faciendo ⟨non⟩ constans apparet sensibus, uti in cantionibus cum flectentes vocem varietatem facimus modulationis. itaque intervallis ea cum versatur, et unde initium fecit et ubi desiit apparet in sonorum patentibus finitionibus, medianis autem patentia intervallis obscurantur.

As the voice changes inflection, it becomes high or low and moves in two ways: continuously or by distinct intervals. Continuous movement settles at no fixed pitch; its boundaries are imperceptible, although the intervening movement is audible, as when we say sol, lux, flos, vox in ordinary speech. We do not identify its precise starting and stopping points, but the ear hears the change from high to low and from low to high. Movement by intervals is different. The voice settles at one definite pitch, then another, and repeatedly passes between them, as in singing when changes of pitch produce melodic variety. The beginnings and endings are then perceptible at the clearly defined notes, while the intervening passage is obscured by the intervals.

3. Genera vero sunt modulationum tria, primum quod Graeci nominant ἁρμονίην, secundum χρῶμα, tertium διάτονον. est autem harmoniae modulatio ab arte concepta, et ea re cantio eius maxime gravem et egregiam habet auctoritatem. chroma subtili sollertia ac crebritate modulorum suaviorem habet delectationem. diatoni vero quod naturalis est, facilior est intervallorum distantia. in his tribus generibus dissimiles sunt tetrachordorum dispositiones, quod harmonia [tetrachordorum] et tonos et dihesis habet binas. dihesis autem est toni pars quarta, ita in hemitonio duae diheses sunt conlocatae. chromati duo hemitonia in ordine sunt composita, tertium trium hemitoniorum est intervallum; dia⟨tono⟩ toni duo sunt continuati, tertium hemitonium finit tetrachordi magnitudinem. ita in tribus generibus tetrachorda ex duobus tonis et hemitonio sunt peraequata, sed ipsa cum separatim uniuscuiusque generis finibus considerantur, dissimilem habent intervallorum designationem.

There are three genera of melody: the first, called harmonia by the Greeks, is the enharmonic; the second is chroma, the chromatic; and the third is the diatonic. The enharmonic is an artistic construction whose melody has a particularly grave and distinguished character. The chromatic offers a gentler pleasure through the subtle skill and closeness of its steps. The diatonic is natural and its intervals are easier to grasp. The tetrachords are divided differently in the three genera. The enharmonic contains two whole tones and two dieses; a diesis is one-quarter of a tone, so two dieses make a semitone. The chromatic has two successive semitones and a third interval of three semitones. The diatonic has two successive whole tones, with a final semitone completing the tetrachord. Each genus therefore spans two tones and a semitone, although the division of that span differs.

4. igitur intervalla tonorum et hemitoniorum et ⟨diheseon⟩ tetrachordorum in voce divisit natura finîtque terminationes eorum mensuris intervallorum quantitate, modisque certis distantibus constituit qualitates, quibus etiam artifices qui organa fabricant ex natura constitutis utendo comparant ad concentus convenientes eorum perfectiones.

Nature has divided the voice into the intervals of tones, semitones and dieses within the tetrachords, fixing their limits by the size of the intervals and establishing distinct qualities at definite distances. Instrument makers use these natural divisions to bring their finished instruments into consonance.

5. Sonitus, qui graece φθόγγοι dicuntur, in unoquoque genere sunt X et VIII, e quibus VIII sunt in tribus generibus perpetui et stantes, reliqui X cum communiter modulantur sunt vagantes. stantes autem sunt qui inter mobiles [sunt] interpositi, continent tetrachordi coniunctionem et e generum discriminibus suis finibus sunt permanentes, appellantur autem sic, proslambanomenos, hypate hypaton, hypate meson, mese, nete synhemmenon, paramese, nete diezeugmenon, nete hyperbolaeon. mobiles autem sunt qui in tetrachordo inter inmotos dispositi in generibus ex locis loca mutant, vocabula autem habent haec, parhypate hypaton, lichanos hypaton, parhypate meson, lichanos meson, trite synhemmenon, <paranete synhemmenon,> trite diezeugmenon, paranete diezeugmenon, trite hyperbolaeon, paranete hyperbolaeon.

The notes, called phthongoi (φθόγγοι) in Greek, number eighteen in each genus. Eight remain fixed in all three genera; the other ten are movable when the genera are considered together. The fixed notes, interposed among the movable ones, maintain the connection of the tetrachords and retain their positions as the genera change. Their names are proslambanomenos, hypate hypaton, hypate meson, mese, nete synhemmenon, paramese, nete diezeugmenon and nete hyperbolaeon. The movable notes occupy positions between the fixed notes within a tetrachord and change their places with the genus. They are parhypate hypaton, lichanos hypaton, parhypate meson, lichanos meson, trite synhemmenon, ⟨paranete synhemmenon⟩, trite diezeugmenon, paranete diezeugmenon, trite hyperbolaeon and paranete hyperbolaeon.

6. ei autem qua moventur, recipiunt virtutes alias, intervalla enim et distantias habent crescentes. itaque parhypate, quae in harmonia distat ab hypate <dimidium> hemitonium, in chroma transmutata habet hemitonium. quae lichanos in harmonia dicitur, ab hypate distat hemitonium, in chroma translata progreditur duo hemitonia, in diatono distat ab hypate tria hemitonia. ita X sonitus propter translationes in generibus efficiunt triplicem modulationum varietatem.

The movable notes acquire different properties as their intervals and distances increase. Thus parhypate, which in the enharmonic lies half a semitone above hypate, lies a semitone above it in the chromatic. Lichanos is a semitone above hypate in the enharmonic, two semitones above it in the chromatic, and three

in the diatonic. Through their changes of position in the genera, these ten notes produce three different arrangements of melody.

7. Tetrachorda autem sunt quinque: primum gravissimum, quod graece dicitur ὕπατον, secundum medianum, quod appellatur μέσον, tertium coniunctum, quod συνημμένον dicitur, quartum disiunctum, quod διεζευγμένον nominatur, quintum, quod est acutissimum, graece ὑπερβόλαιον dicitur. Concentus, quos natura hominis modulari potest, graece quae συμφωνίαι dicuntur, sunt sex: diatessaron, diapente, diapason, et disdiatessaron, et disdiapente, et disdiapason.

There are five tetrachords: the lowest, called hypaton (ὕπατον); the middle, meson (μέσον); the conjunct, synhemmenon (συνημμένον); the disjunct, diezeugmenon (διεζευγμένον); and the highest, hyperbolaion (ὑπερβόλαιον). The consonances that the human voice can produce, called symphonies (συμφωνίαι) in Greek, are six: diatessaron, diapente, diapason, disdiatessaron, disdiapente and disdiapason.

Note — Bk. 5.4 (harmonics). Vitruvius here summarizes the musical theory of Aristoxenus of Tarentum (4th c. BC): the three genera—enharmonic (ἁρμονία), chromatic (χρῶμα), and diatonic (διάτονον)—the eighteen sounds (φθόγγοι) per genus (eight fixed and ten movable), and the five tetrachords (hypaton, meson, synemmenon, diezeugmenon, hyperbolaion) of the Greater Perfect System (systema teleion). It is the earliest Latin source for Greek harmonics; its highly technical, partly Hellenizing terminology requires collation with Aristoxenus (Elementa harmonica) and Ptolemy. Cf. Barker, Greek Musical Writings.

8. ideoque et a numero nomina ceperunt, quod cum vox constiterit in una sonorum finitione ab eaque se flectens mutaverit et pervenerit in quartam terminationem, appellatur diatessaron, in quintam diapente [in sextam diapason, in octavam et dimidiam diapason et diatessaron, in nonam et dimidiam diapason diapente, in XII disdiapason].

These consonances take their names from number. When the voice starts at a definite note and moves to the fourth position, the interval is called diatessaron; when it reaches the fifth, diapente. [The following numerical sequence is excluded from the constituted Latin text: at the sixth, diapason; at the eighth and a half, diapason and diatessaron; at the ninth and a half, diapason and diapente; at the twelfth, disdiapason.]

9. non enim inter duo intervalla, cum chordarum sonitus aut vocis cantus factus fuerit, nec inter tria aut sex aut septem possunt consonantiae fieri, sed uti supra scriptum est, diatessaron et diapente et ex ordine ad disdiapason convenientiae ex natura vocis congruentis habent finitiones, et ei concentus procreantur ex coniunctione sonituum [qui graece φθόγγοι dicuntur].

Consonance does not arise at the second or third interval, or at the sixth or seventh, whether produced by strings or by the singing voice. Rather, as explained above, the fourth and fifth and the sequence extending to the double octave have limits determined by the natural agreement of the voice. These consonances arise from the combination of notes [called phthongoi in Greek].

Critical and musical note — V.4. Harmonice denotes harmonic theory and the passage expressly invokes Aristoxenus. Diatessaron, diapente, diapason, disdiapason, tonos and diesis, together with the enharmonic, chromatic and diatonic genera, retain their specialized meanings. Greek spelling or transliteration can be normalized only where the musical identification is secure; an uncertain reading remains marked.

Chapter 5

1. *Ita ex his indagationibus mathematicis rationibus fiant vasa aerea pro ratione magnitudinis theatri eaque ita fabricentur ut cum tangantur, sonitum facere possint inter se diatessaron diapente et ex ordine ad disdiapason. postea inter sedes theatri constitutis cellis, ratione musica ibi conlocentur ita uti nullum parietem tangant circaque habeant locum vacuum et ab summo capite spatium, ponanturque inversa et habeant in parte quae spectat ad scaenam suppositos cuneos ne minus altos semipede, contraque eas cellas relinquantur aperturae inferiorum graduum cubilibus longae pedes duo, altae semipede.*

On these principles, bronze vessels should be made by mathematical calculation in proportion to the size of the theater. They must be fashioned so that, when struck, they sound in relation to one another at a fourth, a fifth and successively up to the double octave. Vaulted chambers should then be built among the seats and the vessels placed in them according to musical principles. Each vessel must touch none of the surrounding walls and must have free space around it and above. Set the vessels upside down, supported on wedges at least half a foot high on the side facing the stage. Opposite the chambers, leave openings in the beds of the lower seating steps, two feet long and half a foot high.[159]

Editorial note. — The bronze vessels (*echea*, from the Greek ἠχεῖα) were resonating jars set in niches beneath the theater's seats and tuned to the intervals of Greek musical theory — the enharmonic, chromatic and diatonic genera that Vitruvius takes from Aristoxenus of Tarentum — so that they would vibrate in sympathy with the actor's voice and reinforce its clarity. It is one of the few passages where Vitruvius sets out a precise acoustic application of Greek harmonics. It should be noted, however, that the archaeological evidence for such vessels is scant and disputed: niches and, in some theaters, jars that might have served the purpose have been found, but no assemblage that confirms the full system described here.

159Vitruvius describes tuned bronze sounding vessels, vasa aerea or ἠχεῖα, in De architectura 5.5. The acoustic pots found in some medieval churches belong to a different historical and material context. Their intended function and any connection with Vitruvian practice require separate archaeological assessment.

2. designationes autem eorum, quibus in locis constituantur, sic explicentur. si non erit ampla magnitudine theatrum, media altitudinis transversa regio designetur et in ea tredecim cellae duodecim aequalibus intervallis distantes confornicentur, uti ea echea quae supra scripta sunt ad neten hyperbolaeon sonantia in cellis, quae sunt in cornibus extremis, utraque parte prima conlocentur, secunda ab extremis diatessaron ad neten diezeugmenon, tertia diatessaron ad paramesen, quarta ad neten synhemmenon, quinta diatessaron ad mesen, sexta diatessaron ad hypaten meson, in medio unum diatessaron ad hypaten hypaton.

Their positions should be laid out as follows. In a theater of modest size, mark a transverse line halfway up the seating and construct thirteen vaulted chambers along it, separated by twelve equal intervals. On each side, place first in the outermost chamber a vessel sounding nete hyperbolaeon. In the next chamber inward, place one a fourth away, sounding nete diezeugmenon; in the third, one a fourth away at paramese; in the fourth, one at nete synhemmenon; in the fifth, one a fourth away at mese; and in the sixth, one a fourth away at hypate meson. In the central chamber, place a single vessel a fourth away at hypate hypaton.

3. ita hac ratiocinatione vox a scaena uti ab centro profusa se circumagens tactuque feriens singulorum vasorum cava excitaverit auctam claritatem et concentu convenientem sibi consonantiam. sin autem amplior erit magnitudo theatri, tunc altitudo dividatur in partes IIII, uti tres efficiantur regiones cellarum transverse designatae, una harmoniae, altera chromatos, tertia diatoni. et ab imo quae erit prima, ea ex harmonia conlocetur ita uti in minore theatro supra scriptum est.

With this arrangement, the voice spreading from the stage as from a center strikes the hollow of each vessel and acquires greater clarity, producing through resonance a consonance in harmony with itself. In a larger theater, divide the height of the seating into four parts and arrange three transverse rows of chambers: one for the enharmonic genus, another for the chromatic and the third for the diatonic.

4. in mediana autem prima in extremis cornibus ad chromaticen hyperbolaeon habentia sonitum ponantur, in secundis ab his diatessaron ad chromaticen diezeugmenon, in tertiis ad chromaticen synhemmenon, quartis diatessaron ad chromaticen meson, quintis diatessaron ad chromaticen hypaton, sextis ad

paramesen, quod et ad chromaticen hyperbolaeon diapente et ad chromaticen synhemmenon diatessaron habet consonantiae communitatem.

In the middle row, place at each outer end a vessel sounding chromatic hyperbolaeon. Place in the second chamber a vessel a fourth away at chromatic diezeugmenon; in the third, one at chromatic synhemmenon; in the fourth, one a fourth away at chromatic meson; in the fifth, one a fourth away at chromatic hypaton; and in the sixth, one at paramese. This last note has a fifth in common with chromatic hyperbolaeon and a fourth with chromatic synhemmenon.

5. in medio nihil est conlocandum, ideo quod sonitûm nulla alia qualitas in chromatico genere symphoniae consonantiam potest habere. in summa vero divisione et regione cellarum in cornibus primis ad diatonon hyperbolaeon fabricata vasa sonitu ponantur, in secundis diatessaron ad diatonon <diezeugmenon>, tertiis ad diatonon synhemmenon, quartis diatessaron ad diatonon meson, quintis diatessaron ad diatonon hypaton, sextis diatessaron ad proslambanomenon, in medio ad mesen, quod ea et ad proslambanomenon diapason et ad diatonon hypaton diapente habet symphoniarum communitates.

Nothing should be placed in the central chamber, since no other pitch in the chromatic genus can form the required consonance. In the upper row, place at the outer ends vessels sounding diatonic hyperbolaeon; in the second chambers, a fourth away at diatonic ⟨diezeugmenon⟩; in the third, at diatonic synhemmenon; in the fourth, a fourth away at diatonic meson; in the fifth, a fourth away at diatonic hypaton; and in the sixth, a fourth away at proslambanomenos. In the middle, place a vessel at mese, which forms an octave with proslambanomenos and a fifth with diatonic hypaton.

6. haec autem si qui voluerit ad perfectum facile perducere, animadvertat in extremo libro diagramma musica ratione designatum, quod Aristoxenus magno vigore et industria generatim divisis modulationibus constitutum reliquit. de quo si qui ratiocinationibus his attenderit, ad [naturas vocis et] audientium delectationes facilius valuerit theatrorum efficere perfectiones.

Anyone wishing to carry this arrangement through accurately should consult the musical diagram at the end of this book, which Aristoxenus established with great care and effort by distinguishing the melodic genera. Attention to that diagram and these calculations will make it easier to complete theaters that give pleasure to their listeners.

7. Dicet aliquis forte multa theatra quotannis Romae facta esse neque ullam rationem harum rerum in his fuisse, sed errabit in eo, quod omnia publica lignea theatra tabulationes habent complures, quas necesse est sonare. hoc vero licet animadvertere etiam ab citharoedis, qui superiore tono cum volunt canere, avertunt se ad scaenae valvas et ita recipiunt ab earum auxilio consonantiam vocis. cum autem ex solidis rebus theatra constituuntur, id est ex structura caementorum, lapide, marmore, quae sonare non possunt, tunc echeis hae rationes sunt explicandae.

Someone may object that many theaters are built in Rome each year without any provision of this kind. The objection overlooks the many boarded surfaces in public wooden theaters, which necessarily resonate. The same effect can be observed in cithara players: when they wish to sing in a higher register, they turn toward the stage doors and obtain support for the resonance of their voices. When theaters are built of solid materials—rubble masonry, stone or marble—which do not resonate in this way, the system of sounding vessels must be employed.

8. sin autem quaeritur in quo theatro ea sint facta, Romae non possumus ostendere sed in Italiae regionibus et in pluribus Graecorum civitatibus, etiamque auctorem habemus Lucium Mummium, qui diruto theatro Corinthiorum ea aenea Romam deportavit et de manubiis ad aedem Lunae dedicavit. multi etiam sollertes architecti, qui in oppidis non magnis theatra constituerunt, propter inopiam fictilibus doliis ita sonantibus electis hac ratiocinatione compositis perfecerunt utilissimos effectus.

If one asks in which theaters this arrangement has been used, we cannot point to an example at Rome, but there are examples in the regions of Italy and in many Greek cities. We also have the testimony of Lucius Mummius, who, after the destruction of the theater at Corinth, brought its bronze vessels to Rome and dedicated them from the spoils at the temple of Luna. Many resourceful architects working in small towns, unable to afford bronze, have selected earthenware jars with the appropriate tones and arranged them on these principles, obtaining highly useful results.

Editorial note. — The echea (ἠχεῖα, Chapter 5) are among the most celebrated — and most disputed — passages of the treatise. Vitruvius prescribes tuned bronze vessels, set in niches among the seats and proportioned to the size of the

theater, to gather and clarify the voice from the stage; he distributes them by the notes of the three Greek genera (enharmonic, chromatic and diatonic), following the harmonic theory of Aristoxenus, to whose diagram — in the now-lost end of the book — he refers. No vessels that are certainly Vitruvian survive, and their efficacy has been questioned since the Renaissance; yet the resonating niches found in several ancient theaters, and the acoustic jars built into medieval church walls, attest the persistence of the idea. Whatever their practical effect, this remains the fullest account of architectural acoustics to come down from antiquity (cf. the theory of consonance in 5.4 and the Conspectus of Greek Terms).

Critical and archaeological note — V.5. The vasa aerea or ἠχεῖα are presented as tuned resonant vessels intended to improve the clarity and consonance of the voice. Comparison with a modern resonator is heuristic and requires dimensions, material and context before identity of mechanism can be asserted. The reference to Aristoxenus's diagramma remains essential; a reconstructed diagram is identified as a reconstruction rather than incorporated as a surviving Vitruvian original.

Chapter 6

1. *Ipsius autem theatri conformatio sic est facienda uti quam magna futura est perimetros imi, centro medio conlocato circumagatur linea rotundationis, in eaque quattuor scribantur trigona paribus lateribus ⟨quae paribus⟩ intervallis, extremam lineam circinationis tangant, quibus etiam in duodecim signorum caelestium <⟨astrologia⟩> astrologi ex musica convenientia astrorum ratiocinantur. ex his trigonis cuius latus fuerit proximum scaenae, ea regione qua praecidit curvaturam circinationis, ibi finiatur scaenae frons, et ab eo loco per centrum parallelos linea ducatur, quae disiungat proscaenii pulpitum et orchestrae regionem.*

2. The configuration of the theater itself is to be made in such a way that, however large the perimeter will be, a line of the rounding (rotundatio) is described about the center placed in the middle, and four triangles are inscribed in it with equal sides and intervals, which touch the outermost line of the circumference, by which astrologers also reason from the concordance of the stars in the twelve celestial signs. From these triangles, the side of which is closest to the stage, in the region where it intersects the curvature of the circumference, the front of the stage is to end there, and from that place a parallel line is drawn through the center, which separates the stage platform of the proscenium and the region of the orchestra.

Note — Bk. 5.6.1 (the geometry of the theater). The plan of the Roman theater is set out by inscribing in the circle of the orchestra four equilateral triangles that touch it at twelve points—as astrologers dispose the twelve signs of the zodiac by the musical consonance of the stars. The sides of these triangles fix the front of the stage, the direction of the stairs (scalaria), and the axes of the seating. It is an exact geometric construction, akin to the analemma method (see Book IX); Vitruvius refers its drawing to a figure at the end of the book. The Greek theater (5.7) instead uses three squares.

Comparative note — Bk. 5.6–5.7 (plan of the theater). The geometrical setting-out of the theater is one of the most studied passages of Book V. Catherine Saliou's Budé (2009) weighs the alternatives of restitution cautiously and warns that the Vitruvian scheme —four equilateral triangles inscribed in

the circle of the orchestra, like the twelve signs of the zodiac — is rarely verified exactly in surviving theaters; only the relation of the pulpitum to the diameter of the orchestra proves checkable. Granger (Loeb) and Rowland–Howe (Cambridge, 1999) stress the typological difference (the Roman pulpitum, deeper and lower, with the orchestra reserved for senators, against the Greek, with its wide orchestra); the Nexus Network Journal has re-examined the 'twelve-pointed star' and J. B. Small's hypothesis of a system of circles. This edition keeps the transmitted text and translates in its own voice; the musical-astral analogy with the zodiac is Vitruvius's own, not an interpolation.

2. ita latius factum fuerit pulpitum quam Graecorum, quod omnes artifices in scaena dant operam, in orchestra autem senatorum sunt sedibus loca designata. et eius pulpiti altitudo sit ne plus pedum quinque, uti qui in orchestra sederint, spectare possint omnium agentium gestus. cunei spectaculorum in theatro ita dividantur uti anguli trigonorum, qui currunt circum curvaturam circinationis, dirigant ascensus scalasque inter cuneos ad primam praecinctionem, supra autem alternis itineribus superiores cunei medii dirigantur.

2. The stage-platform (pulpitum) should be made wider than that of the Greeks, because all the artists work on the stage. Places are designated for the seats of the senators in the orchestra. And the height of the stage platform should not exceed five feet, so that whoever sits in the orchestra can watch the movements of all the actors. The wedges of the spectacles in the theater should be divided in such a way that the corners of the triangles, which run around the curvature of the circumference, direct the ascents and stairs between the wedges to the first enclosure, and above all, the upper wedges in the middle should be directed by alternate routes.

Thus, the stage-platform (pulpitum) was made wider than that of the Greeks, because all the performers act on the stage, but in the orchestra there are designated places for the senators' seats. And the height of their audience should not be more than five feet, so that those sitting in the orchestra can observe the movements of all the performers. The seating sections in the theater are so divided that the angles of the triangles, which trace the curvature of the circle, direct the ascents and staircases between the sections to the first chamber; and above, the upper middle sections are directed by alternative routes.

3. Hi autem qui sunt in imo et dirigunt scalaria, erunt numero VII, reliqui quinque scaenae designabunt compositionem, et unus medius contra se valvas regias habere debet, et qui erunt dextra sinistra hospitaliorum designabunt compositionem, extremi duo spectabunt itinera versurarum. gradus spectaculorum ubi subsellia componantur ne minus alti sint palmopede, <ne plus pedem> et digitos sex, latitudines eorum ne plus pedes duo semis, ne minus pedes duo constituantur.

3. But those who are at the bottom and direct the stairs will be seven in number, the remaining five stages will designate the composition, and the one in the middle should have the royal doors opposite it, and those who will be on the right and left of the hospitals will designate the composition, the two outermost will watch the routes of the turns. The steps of the spectacles where the seats are arranged should be no less than a palm's breadth high, <no more than a foot> and six fingers, their widths should be no more than two and a half feet, no less than two feet.

Now, these, who are below and direct the stairs, will be in number 7; the other five scenes will designate the composition: and the one in the middle must have the royal valves in front, and those that will be on the right and left will designate the composition of the hospitals, the last two will watch over the routes of the turns. The steps of the spectacles, where the seats are arranged, the steps must not be less than a palm, <no more than a foot> and six inches high; their widths must not be greater than two and a half feet, nor less than two feet.

4. tectum porticus quod futurum est in summa gradatione, cum scaenae altitudine libratum perficiatur, ideo quod vox crescens aequaliter ad summas gradationes et tectum perveniet. namque si non erit aequale, quo minus fuerit altum, vox praeripietur ad eam altitudinem quam perveniet primo.

4. The roof of the portico at the top of the seating should be level with the top of the stage building, so that the rising voice reaches the upper rows and the roof together. If these heights are unequal, the voice will be intercepted at the lower level it first encounters.

Technical paraphrase of 5.6.4. The upper portico and the stage building should reach the same height. Vitruvius relates that alignment to the

transmission of the voice toward the upper seating; he is not making the portico roof level with the actors' platform.

5. orchestra inter grados imos quod diametron habuerit, eius sexta pars sumatur, et in cornibus utrimque ad eius mensurae perpendiculum inferiores sedes praecidantur, et qua praecisio fuerit, ibi constituantur itinerum supercilia. ita enim satis altitudinem habebunt eorum confornicationes.

5. Take one-sixth of the diameter of the orchestra measured between the lowest seating tiers. At the two ends of the orchestra, cut back the lower seats vertically to this height and place the lintels of the passages at the resulting level. Their vaults will then have sufficient height.

Technical paraphrase of 5.6.5: the orchestra diameter supplies the vertical clearance for the lateral entrances. Cutting back the lower seats and setting the passage lintels at that level allows sufficient height for the entrance vaults.

6. scaenae longitudo ad orchestrae diametron duplex fieri debet. podii altitudo ab libramento pulpiti cum corona et lysi duodecumam orchestrae diametri. supra podium columnae cum capitulis et spiris altae quarta parte eiusdem diametri, epistylia et ornamenta earum columnarum altitudinis quinta parte. pluteum insuper cum unda et corona inferioris plutei dimidia parte. supra id pluteum columnae quarta parte minore altitudine sint quam inferiores, epistylium et ornamenta earum columnarum quinta parte. item si tertia episcenos futura erit, mediani plutei summum sit dimidia parte, columnae summae medianarum minus altae sint quarta parte, epistylia cum coronis earum columnarum item habeant altitudinis quintam partem.

6. The length of the stage building should be twice the diameter of the orchestra. The podium, including its crowning moldings, should rise one-twelfth of that diameter above the stage platform. The columns above it, including capitals and bases, should be one-quarter of the same diameter in height; their architraves and entablatures, one-fifth of the column height. The parapet above, including its cymatium and cornice, should be half the height of the lower parapet. The columns above this parapet should be one-quarter shorter than those below, with their entablatures one-fifth of their own height. If there is a third stage elevation, its upper parapet should be half the height of the middle parapet; the uppermost columns should be one-quarter shorter than the middle columns,

and their architraves and cornices should likewise be one-fifth of the column height.

Technical paraphrase of 5.6.6: the orchestra diameter governs the dimensions of the stage facade. The first podium is one-twelfth of that diameter; the first columns, including capitals and bases, are one-quarter. Each successive order is reduced by one-quarter, while its entablature remains one-fifth of its column height. The parapets are reduced by half at each level.

7. Nec tamen in omnibus theatris symmetriae ad omnes rationes et effectus possunt respondere, sed oportet architectum animadvertere quibus proportionibus necesse sit sequi symmetriam et quibus ad loci naturam aut magnitudinem operis temperari. sunt enim res quas et in pusillo et in magno theatro necesse est eadem magnitudine fieri propter usum, uti gradus diazomata pluteos itinera ascensus pulpita tribunalia et si qua alia intercurrunt ex quibus necessitas cogit discedere ab symmetria ne inpediatur usus. non minus si qua exiguitate copiarum, id est marmoris, materiae reliquarumque rerum quae parantur, in opere defuerint, paulum demere aut adicere, dum id ne nimium inprobe fiat sed cum sensu, non erit alienum. hoc autem erit si architectus erit usu peritus, praeterea ingenio mobili sollertiaque non fuerit viduatus.

7. Yet in all theaters symmetries cannot correspond to all reasons and effects, but the architect must observe with what proportions it is necessary to follow symmetry and with which to temper it to the nature of the place or the size of the work. For there are things which in both a small and a large theater it is necessary to make the same size for the sake of use, such as steps, diazomata, shelves, itinerant ascents, pulpits, tribunals, and if there are such things which intersect from which necessity compels a departure from symmetry lest use be hindered. Not less, if there is any scarcity of supplies, that is, of marble, materials, and other things which are prepared, in the work, a little should be taken away or added, provided that this is not done too improperly but with sense, it will not be out of place. This will be the case if the architect is skilled in use, and moreover is not deprived of mobile talent and skill.

Not all theaters can be designed with symmetry to suit every reason and effect, but the architect must observe the proportions that necessitate symmetry and that must be moderated according to the nature or size of the venue. For there are things that, in both small and large theaters, must be the

same size for their intended use, such as steps, platforms, shelves, aisles, ramps, pulpits, benches, and other elements that are joined together. The necessity of these elements compels us to depart from symmetry, so as not to impede their functionality. Nor should there be a shortage of supplies—marble, materials, and other items being prepared —on the construction site. Adding or subtracting a little, as long as it's done judiciously and with common sense, is perfectly acceptable. And this will be the case if the architect is skilled in practice and, moreover, hasn't lost his practical intelligence and resourcefulness.

8. Ipsae autem scaenae suas habent rationes explicitas ita uti mediae valvae ornatus habeant aulae regiae, dextra ac sinistra hospitalia, secundum autem spatia ad ornatus comparata, quae loca Graeci περιάκτοι dicunt ab eo quod machinae sunt in his locis versatiles trigonoe habentes singulares species ornationis, quae cum aut fabularum mutationes sunt futurae seu deorum adventus cum tonitribus repentinis, [ea] versentur mutentque speciem ornationis in frontes. secundum ea loca versurae sunt procurrentes, quae efficiunt una a foro, altera a peregre aditus in scaenam.

8. The scenes themselves have their own elaborate arrangements, such that the middle doors have decorations for the royal courts, the right doors for the hospitals, and the spaces for the decorations, which the Greeks call periaktos, from the fact that in these places there are machines, each with three kinds of decorations, which, when changes in the plays are to come or the arrival of the gods with sudden thunder, are turned and change the kind of decorations in front. According to these places, there are turnings that run forward, one forming the forum, the other the entrance to the stage.

But the scenes themselves have their own explicit reasons, so that the middle valve has the decorations of the royal court, the right and left the hospitals, and the second spaces in comparison with the decorations, places which the Greeks say are pericates because there are machines in these places which have versatile triangles in each of the three types of ornament, which when there are future changes in the stories or the coming of the gods, with sudden thunder they turn and change the appearance of the ornament on the fronts. According to these places run passages, which form the entrance to the stage, one from the market and another from the outside.

9. genera autem sunt scaenarum tria, unum quod dicitur tragicum, alterum comicum, tertium satyricum. horum autem ornatus sunt inter se dissimili disparique ratione, quod tragicae deformantur columnis et fastigiis et signis reliquisque regalibus rebus, comicae autem aedificiorum privatorum et maenianorum habent speciem prospectusque fenestris dispositos imitatione, communium aedificiorum rationibus, satyricae vero ornantur arboribus speluncis montibus reliquisque agrestibus rebus in topeodis speciem deformati.

9. There are three kinds of scenes, one which is called tragic, the other comic, the third satirical. But the decorations of these are different from each other and in different ways, because the tragic ones are deformed with columns and pinnacles and standards and other royal things, while the comic ones have the appearance of private and walled buildings and have windows arranged in imitation of public buildings, while the satirical ones are decorated with trees, caves, mountains and other rural things deformed into the appearance of a landscape.

Now, there are three kinds of scenes: one is called tragic, another comic, and the third satyr. Now, the ornaments of these are different from each other and in a disparate way, because the tragic ones are deformed by columns and pinnacles and signs and other real things; but the domes of private buildings and mansions have the appearance of frames and windows arranged in imitation of the plans of common buildings; the satyrs, on the other hand, are adorned with trees, caves, mountains, and other wild things, deformed in the form of a topoid.

Critical and geometrical note — V.6. The Latin theater plan begins with four inscribed equilateral triangles. Its geometry must be reconstructed from the Latin instructions rather than forced to match a preconceived modern drawing. Pulpitum, orchestra, valvae regiae, hospitalia, versurae, diazomata and περίακτοι remain distinct technical elements. The pulpitum's maximum height of five feet is retained in Roman units; a metric conversion belongs separately in the commentary and must state its value for the pes.

Chapter 7

1. *In Graecorum theatris non omnia isdem rationibus sunt facienda, quod primum in ima circinatione ut in latino trigonorum IIII, in eo quadratorum trium anguli circinationis lineam tangunt, et cuius quadrati latus est proximum scaenae praeciditque curvaturam circinationis, ea regione designatur finitio proscaenii. et ab ea regione ad extremam circinationem curvaturae parallelos linea designatur, in qua constituitur frons scaenae, per centrumque orchestrae proscaenii regioni parallelos linea describitur et qua secat circinationis lineas dextra ac sinistra in cornibus hemicycli centra signantur, et circino conlocato in dextra ab intervallo sinistro circumagitur circinatio ad proscaenii sinistram partem, item centro conlocato in sinistro cornu ab intervallo dextro circumagitur ad proscaenii dextram partem.*

Comparative note — Bk. 5.7 (the Greek theater). Unlike the Roman theater—set out with four triangles (5.6)—the Greek is ordered with three squares inscribed in the circle of the orchestra. Hence its distinctive features: a wider orchestra, used by the chorus; a more recessed stage; and a platform (logeîon, λογεῖον) narrower and higher, of ten to twelve feet, since the actors perform on the proscaenium while the chorus moves below. The editions keep the Greek terminology; Rowland and Howe (Cambridge, 1999) specify the reconstruction of the platform; Gros (Budé) relates it to the surviving Hellenistic theaters. The present edition keeps the Graecisms and translates in its own words. [Historical-architectural note] The Roman/Greek distinction reflects different scenic uses: at Rome, senators in the orchestra and the show on the pulpitum; in Greece, the chorus in the orchestra.

In Greek theaters, not everything should be done according to the same principles, because first, in the lower circle, as in the Latin trigon IV, the squares of the three corners touch the line of the circle, and the side of the plaza that is next to the stage and cuts the curvature of the circle, in that region, the end of the proscenium is designated. And from that region to the end of the circle, a line parallel to the curvature is drawn, in which the front of the stage is formed, and through the center of the orchestra, a line parallel to the proscenium region is described, and because it cuts the lines of the circle, the right and left lines are marked in the centers of the horns of the hemicycle. And having been placed on the right, from the left interval, the circle moves

towards the left side of the proscenium; likewise, placed in the center of the left wing, it moves from the right interval towards the right side of the proscenium.

2. ita tribus centris hac descriptione ampliorem habent orchestram Graeci et scaenam recessiorem minoreque latitudine pulpitum, quod λογεῖον appellant, ideo quod ⟨apud⟩ eos tragici et comici actores in scaena peragunt, reliqui autem artifices suas per orchestram praestant actiones, itaque ex eo scaenici et thymelici graece separatim nominantur. eius logei altitudo non minus debet esse pedum X, non plus duodecim. gradationes scalarum inter cuneos et sedes contra quadratorum angulos dirigantur ad primam praecinctionem, a praecinctione inter eas iterum mediae dirigantur, et ad summam quotiens praecinguntur, altero tanto semper amplificantur.

Nomenclature note — Bk. 5.7.2 (the Greek stage). Technical terms retained with the Graecism and transliteration at first occurrence: orchestra (ὀρχήστρα), the circular space of the chorus; proscaenium / λογεῖον (logeîon), the raised platform of the actors; σκηνή (skené), the stage-building; παρασκήνια (paraskénia), its side-wings.

In the Greek arrangement, these three centers produce a larger orchestra, a stage front set farther back, and a narrower stage platform, called the logeion. Tragic and comic actors perform on the stage, while the other performers act in the orchestra; hence the distinction between skenikoi and thymelikoi. The logeion should be no less than ten feet and no more than twelve feet high. The stairways between the lower seating blocks are directed toward the corners of the squares up to the first cross-passage. Above that passage, a second set of stairways is placed between the first; the same division is repeated at each succeeding passage.

Critical and theatrical note — V.7. The Greek theater uses three inscribed squares, a larger orchestra, a stage placed farther back and a narrower logeion. Λογεῖον, σκηνικοί and θυμελικοί are preserved with explanations of the functions Vitruvius assigns them. A single modern word such as ‘stage’ can erase the distinctions between performance spaces and categories of performer.

Chapter 8

1. *Cum haec omnia summa cura sollertiaque explicata sunt, tunc etiam diligentius est animadvertendum uti sit electus locus, in quo leniter adplicet se vox neque repulsa resiliens incertas auribus referat significationes. sunt enim nonnulli loci naturaliter inpedientes vocis motus, uti desonantes, qui graece dicuntur κατηχοῦντες, circumsonantes qui apud eos nominantur περιηχοῦντες, item resonantes qui dicuntur ἀντηχοῦντες, consonantesque quos appellant συνηχοῦντας. desonantes sunt in quibus vox prima cum est elata in altitudinem, offensa superioribus solidis corporibus repulsaque residens in imo opprimit insequentis vocis elationem,*

2. When all this has been set out with the utmost care and skill, then still greater vigilance is needed to ensure that a site is chosen on which the voice settles gently and is not thrown back in such a way as to carry uncertain meanings to the ears. There are, indeed, places that by their nature hinder the movement of the voice: the dissonant, called in Greek κατηχοῦντες (katechountes); the circumsonant, which they name περιηχοῦντες (periechountes); the resonant, called ἀντηχοῦντες (antechountes); and the consonant, which they call συνηχοῦντες (synechountes). The dissonant are those in which the first voice, rising aloft, strikes solid bodies above and, driven back, settles below and smothers the rise of the voice that follows.

Nomenclature note — Bk. 5.8 (the four acoustic classes). Vitruvius classifies sites by their acoustic behavior with four Graecisms, retained here with transliteration: dissonantes / κατηχοῦντες (katechountes), places that smother the voice; circumsonantes / περιηχοῦντες (periechountes), which scatter it around; resonantes / ἀντηχοῦντες (antechountes), which double it in echo; and consonantes / συνηχοῦντες (synechountes), which reinforce it with clarity. Here casus means the final syllables of words (their endings), not «cases»: defective places devour or double the word-endings.

2. circumsonantes autem in quibus circumvagando coacta exsolvens in medio, sine extremis casibus sonans ibi extinguatur incerta verborum significatione, resonantes vero in quibus cum in solido tactu percussa resiliat, imagines exprimendo novissimos casus duplices faciat auditu. item consonantes sunt in quibus ab imis auxiliata cum incremento scandens egrediatur ad aures diserta verborum claritate. ita si in locorum electione fuerit diligens animadversio,

emendatus erit prudentia ad utilitatem in theatris vocis effectus. formarum autem descriptiones inter se discriminibus his erunt notatae uti quae Graecorum habent usus ex quadratis designentur,, latina e paribus lateribus trigonorum. ita his praescriptionibus qui voluerit uti, emendatas efficiet theatrorum perfectiones.

The circumsonant are those in which the voice, forced to wander round, dissolves in the middle and, sounding there without its final syllables, dies away in an uncertain meaning of the words. The resonant are those in which, striking against a solid body, it rebounds and, forming echoes, doubles the last syllables to the ear. The consonant are those in which the voice, supported from below, rises with increasing strength and reaches the ears with distinct clarity of words. Thus, if due attention is given to the choice of site, prudence will secure, to good effect, the sound of the voice in theaters. The layouts of the plans will be marked by this difference between them: those designed from squares serve Greek usage; the Latin, from triangles of equal sides. Whoever chooses to follow these prescriptions will achieve theaters of finished perfection.

Historical-architectural note — Bk. 5.8.2. The chapter's close condenses the typological distinction: the Greek plan is set out from squares (three inscribed squares, 5.7) and the Latin from equilateral triangles (four triangles, 5.6). Vitruvius's acoustic classification—unique in ancient literature—anticipates notions of modern architectural acoustics (reflection, echo, reinforcement), and has guided the analysis of ancient theaters since the Renaissance.

Critical and acoustic note — V.8. Dissonantes, circumsonantes, resonantes and consonantes, with their Greek equivalents, constitute an ancient classification of places by the behavior of the voice. Modern echo, reverberation and resonance are useful comparative terms, but are not exact substitutes for all the ancient categories.

Chapter 9

1. *Post scaenam porticus sunt constituendae, uti cum imbres repentini ludos interpellaverint, habeat populus quo se recipiat ex theatro choragiaque laxamentum habeant ad comparandum. uti sunt porticus Pompeianae itemque Athenis porticus Eumenicae Patrisque Liberi fanum, et exeuntibus e theatro sinistra parte odeum, quod Themistocles columnis lapideis dispositis, navium malis et antemnis e spoliis Persicis pertexit, ideo autem etiam incensum Mithridatico bello rex Ariobarzanes restituit, Smyrnae Stratoniceum, Trallibus porticus ex utraque parte est scaenae supra stadium, ceterisque civitatibus quae diligentiores habuerunt architectos circa theatra sunt porticus et ambulationes.*

2. Behind the stage, porticos are to be built, so that when sudden showers interrupt the games, the people may have a place to retreat from the theater and a place to rest while preparing for the festivities. Such are the porticos of Pompeii, and also in Athens the porticos of the Eumenes and the Parumontes and the temples of Liber, and on the left side of those leaving the theater, the ode, which Themistocles covered with stone columns, the masts of ships, and the antlers from the spoils of the Persians, and the same incense burner was restored by King Ariobarzanes during the Mithridatic war, the Stratoniceum at Smyrna, the porticos at Trallis on both sides of the stage above the stadium, and in other cities that have had more diligent architects, there are porticos and walks around the theaters.

Porticoes will be placed behind the stage so that, when sudden rains interrupt the performances, the people will have a place to retreat from the theater, and the stage crews a place to prepare. The portico of Pompeii, and also that of Eumenia and Patris Liberus in Athens, served for the sanctuary and, upon leaving the theater, on the left side of the ode, which Themistocles, arranged with stone columns, covered the evils of the ships and the overseers of the booty of the Persians (and the same incense was also restored by King Ariobarzanes in the Mithridatic War); Stratonic of Smyrna; The porticoes on each side, like the stage, above the stage; And in the other states, which had more diligent architects, there are galleries and promenades around the theaters.

2. quae videntur ita oportere conlocari uti duplices sint habeantque exteriores columnas doricas cum epistyliis et ornamentis ex ratione modulationis perfectas.

latitudines autem earum ita oportere fieri videntur uti quanta altitudo columnae fuerit exterioris, tantam latitudinem habeant ab inferiore parte columnarum extremarum ad medias et a medianis ad parietes qui circumcludunt porticus ambulationes. medianae autem columnae quinta parte altiores sint quam exteriores, sed aut ionico aut corinthio genere deformentur.

2. which seem to be so placed that they are double and have exterior Doric columns with epistyles and ornaments perfect in proportion to the modulation. Their widths seem to be made so that the height of the exterior columns is such that they have as much width from the lower part of the outer columns to the middle ones and from the middle ones to the walls that enclose the portico walks. The middle columns, however, are to be a fifth higher than the exterior ones, but are to be shaped either in the Ionic or Corinthian style.

Technical paraphrase of 5.9.2. Arrange the walks as double porticoes, with Doric columns on the outside and their architraves and ornaments proportioned by a common module. The distance from the lower part of the outer columns to the middle row, and from the middle row to the enclosing wall, should equal the height of the outer columns. The middle columns are one-fifth taller and are formed in the Ionic or Corinthian order.

3. columnarum autem proportiones et symmetriae non erunt isdem rationibus quibus in aedibus sacris scripsi. aliam enim in deorum templis debent habere gravitatem, aliam in porticibus et ceteris operibus subtilitatem. itaque si dorici generis erunt columnae, dimetiantur earum altitudines cum capitulis in partes XV. ex eis partibus una constituatur et fiat modulus, ad cuius moduli rationem omnis operis erit explicatio. et in imo columnae crassitudo fiat duorum modulorum, intercolumnium quinque et moduli dimidia parte, altitudo columnae praeter capitulum XIIII modulorum, capituli altitudo moduli unius, latitudo modulorum duorum et moduli sextae partis. ceteri operis modulationes uti in aedibus sacris in libro IIII scriptum est ita perficiantur.

3. The proportions and commensurability of these columns do not follow the same rules as those prescribed for sacred buildings: temples require one degree of dignity, porticoes and other works another degree of slenderness. For Doric columns, divide their height, including the

capitals, into fifteen parts. One part becomes the module governing the whole work. Make the lower diameter two modules and the intercolumniation five and a half. The shaft, excluding the capital, is fourteen modules high; the capital is one module high and two and one-sixth modules wide. Complete the remaining members according to the temple rules given in Book IV.

Technical paraphrase of 5.9.3. Columns in porticoes require a more slender treatment than those in temples. For Doric columns, divide the total height, including the capital, into fifteen modules. The lower diameter is two modules; the clear intercolumniation is five and a half. The shaft is fourteen modules high and the capital one module high, with a width of two and one-sixth modules. Complete the remaining members according to the Doric rules in Book IV.

4. sin autem ionicae columnae fient, scapus praeter spiram et capitulum in octo et dimidiam partem dividatur et ex his una crassitudini columnae detur, <spira> cum plintho dimidia crassitudine constituatur, capituli ratio ita fiat uti in libro tertio est demonstratum. si corinthia erit, scapus et spira uti in ionica, capitulûm autem quemadmodum in quarto libro est scriptum, ita habeant rationem. stylobatisque adiectio quae fit per scamillos inpares, ex descriptione quae supra scripta est in libro tertio sumatur. epistylia coronae ceteraque omnia ad columnarum rationem ex scriptis voluminum superiorum explicentur.

4. If the columns are Ionic, divide the shaft, excluding the base and capital, into eight and a half parts, and assign one part to the column's diameter. The base, including its plinth, should be half a diameter high; the capital should follow the proportions described in Book III. For Corinthian columns, the shaft and base should follow the Ionic proportions, and the capital those given in Book IV. The addition to the stylobate made by means of the scamilli inpares should follow the description in Book III. The architraves, cornices, and remaining members should be proportioned to the columns as explained in the preceding books.

Technical paraphrase of 5.9.4. The Ionic shaft alone measures eight and a half lower diameters; its base and plinth together measure half a diameter in height. The capital follows Book III. Corinthian shafts and bases use the Ionic rule, while their capitals follow Book IV. The stylobate adjustment described as scamilli inpares refers the reader back to Book III; its disputed construction is not resolved by translating the term as "unequal stools."

5. Media vero spatia quae erunt subdiu inter porticus, adornanda viridibus videntur, quod hypaethroe ambulationes habent, magnam salubritatem, et primum oculorum quod ex viridibus subtilis et extenuatus aer propter motionem corporis influens perlimat speciem et ita auferens ex oculis umorem crassum, aciem tenuem et acutam speciem relinquit. praeterea cum corpus motionibus in ambulatione calescat, umores ex membris aer exsugendo inminuit plenitates extenuatque dissipando quod plus inest quam corpus potest sustinere.

5. The middle spaces, which will lie open to the sky between the porticoes, seem fit to be planted with greenery, because the walks of the hypaethroe have great health benefits, and first of all for the eyes, because the subtle and thin air flowing in from the greenery due to the movement of the body refines the appearance and, taking away the thick moisture from the eyes, leaves a thin and sharp appearance. Moreover, when the body is heated by the movements of walking, the air, by sucking the moisture from the limbs, diminishes the fullness and thins it by dissipating what is more in it than the body can bear.

As for the spaces between the galleries open to the sky, they appear to be adorned with greenery, because the hypatroic walks are very healthy. And firstly, this is true for the eyes, which, due to the movement of the body, flows from the fine, diluted air, filtering their appearance and, thus eliminating the thick moisture from the eyes, leaving a line of thin, clear appearance; moreover, when the body warms up with the movements of walking, the air, by absorbing the moisture from the limbs, reduces their fullness and thins, dissipating what is in them beyond what the body can bear.

6. hoc autem ita esse ex eo licet animadvertere, quod sub tectis cum sint aquarum fontes aut etiam sub terra palustris abundantia, ex his nullus surgit umor nebulosus, sed in apertis hypaethrisque locis cum sol oriens vapore tangat

mundum, ex umidis et abundantibus excitat umores et eos conglobatos in altitudinem tollit. ergo si ita videtur uti in hypaethris locis ab aere umores ex corporibus exsugantur molestiores, quemadmodum ex terra per nebulas videntur, non puto dubium esse quin amplissimas et ornatissimas subdiu hypaethrusque conlocari oporteat in civitatibus ambulationes.

6. But this is so from the fact that, when there are springs of water under roofs or even an abundance of marshes under the ground, no misty moisture rises from these, but in open and humid places, when the rising sun touches the world with vapor, it stirs up the moisture from the moist and abundant places and carries the accumulated moisture to a height. Therefore, if it seems that in humid places the more troublesome moistures are sucked out of the bodies from the air, just as they are seen from the ground through mists, I do not think there is any doubt that the most spacious and most ornate promenades should be placed in cities under humid and humid conditions.

And we can verify this by the fact that, when there are water sources under the roofs, or even under the floor of abundant marshes, misty humidity does not arise from them, but rather in open and humid places, when the rising sun touches the world with vapor, and raises the spirits more abundantly, lifting them to a height. If, therefore, it seems that in high places the humidity of the air is more bothersome, as seen from the ground through the mists, I think there is no doubt that the most extensive and ornate promenades should be located in the high areas.

7. eae autem uti sint semper siccae et non lutosae, sic erit faciendum. fodiantur et exinaniantur quam altissime. dextra atque sinistra structiles cloacae fiant inque earum parietibus qui ad ambulationem spectaverint, tubuli instruantur inclinati fastigio cloacis. his perfectis compleantur ea loca carbonibus, deinde insuper sabulone eae ambulationes sternantur et exaequentur. ita propter carbonum raritatem naturalem et tubulorum in cloacas instructionem excipientur aquarum abundantiae, et ita siccae et sine umore perfectae fuerint ambulationes.

7. But that they may always be dry and not muddy, this is what must be done. They shall be dug and emptied as deep as possible. On the right and left, constructed sewers shall be made, and in their walls, which face the passage, pipes shall be laid out, inclined with a peak into the sewers. When these are

completed, those places shall be filled with coal, then on top of that, those passages shall be spread out and leveled with sand. Thus, because of the natural scarcity of coal and the direction of the pipes into the sewers, abundance of water shall be taken care of, and thus the passages shall be dry and free from moisture.

But they must always be dry and not muddy; this is how it must be done. They must be excavated and emptied as deeply as possible. To the right and left, sewers are built, and in the walls of the passage leading to the promenade, pipes with sloping roofs are laid. When these sewers are finished, these places are filled with coal, and then, in addition, these promenades are spread and leveled with sand. Thus, due to the natural scarcity of coal and the installation of pipes in the sewers, water was received in abundance, and thus the promenades were completed dry and without dampness.

8. Praeterea in his operibus thensauri sunt civitatibus in necessariis rebus a maioribus constituti. in conclusionibus enim reliqui omnes faciliores sunt apparatus quam lignorum. sal enim facile ante inportatur, frumenta publice privatimque expeditius congeruntur et si defit, holeribus carne seu leguminibus defenditur, aquae fossuris puteorum et de caelo repentinis tempestatibus ex tegulis excipiuntur. de lignatione quae maxime necessaria est ad cibum coquendum, difficilis et molesta est apparatio, quod et tarde comportatur et plus consumitur.

8. Furthermore, in these works, the cities have treasuries for the necessary things, established by their forebears against times of need; for in a siege all other supplies are more easily obtained than firewood. The rest are easier to prepare than for wood. For salt is easily brought in beforehand, grain is more expediently stored both publicly and privately, and if it is lacking, it is protected with vegetables, meat or legumes, water is collected from the roof tiles by digging wells and from sudden storms of the sky. The preparation of wood, which is most necessary for cooking food, is difficult and troublesome, because it is both slow to be brought in and consumed more.

Moreover, in these works the cities keep treasuries, established by their forebears against times of need; for in a siege every other supply is more easily come by than firewood.

9. in eiusmodi temporibus tunc eae ambulationes aperiuntur et mensurae tributim singulis capitibus designantur. ita duas res egregias hypaethroe

ambulationes praestant, unam in pace salubritatis, alteram in bello salutis. ergo his rationibus ambulationum explicationes non solum post scaenam theatri sed etiam omnium deorum templis effectae magnas civitatibus praestare poterunt utilitates. Quoniam haec nobis satis videntur esse exposita, nunc insequentur balinearum dispositionum demonstrationes.

9. At such times, then, those walks are thrown open and measured spaces are allotted tribe by tribe. Thus, the walks of the hypaethro perform two excellent functions, one in peace of health, the other in war of safety. Therefore, with these reasons, the explanations of the walks, carried out not only behind the scenes in theaters but also in the temples of all the gods, will be able to perform great benefits for the cities. Since these seem to us to have been sufficiently explained, now there will follow demonstrations of the arrangements of the baths.

On such occasions, these walks are thrown open, and measured spaces are allotted tribe by tribe. Thus proceed the two excellent aspects of hypaethra, one in the peace of health, the other in the war of health. Therefore, according to these reasons, the development of processions, not only behind the stage of the theater but also in the temples of all the gods, can bring great benefits to the states.

Since we feel that these have been sufficiently explained, we will now proceed with the demonstrations of the baths' disposition.

Critical and urban note — V.9. The porticoes behind the stage provide shelter, space for choragia and walking. Planting, ambulationes and drainage are interpreted within Vitruvius's relationship between exercise, salubrity and civic space. Their usefulness during a siege is part of his argument about infrastructure; it should not be generalized as a necessary function of every Roman portico. Reconstructed levels and drainage gradients are distinguished from transmitted measurements.

Chapter 10

1. primum eligendus locus est quam calidissimus, id est aversus ab septentrione et aquilone. ipsa autem caldaria tepidariaque lumen habeant ab occidente hiberno, si autem natura loci inpedierit, utique a meridie, quod maxime tempus lavandi a meridiano ad vesperum est constitutum. et item est animadvertendum uti caldaria muliebria et virilia coniuncta et in isdem regionibus sint conlocata. sic enim efficietur ut vasaria et hypocausis communis sit eorum utrisque. aenea supra hypocausim tria sunt componenda, unum caldarium, alterum tepidarium, tertium frigidarium, et ita conlocanda uti ex tepidario in caldarium quantum aquae caldae exierit, influat

1. First, a place should be chosen that is as warm as possible, that is, facing away from the north and the north-east. The caldariums and tepidariums themselves should have light from the winter west, but if the nature of the place prevents this, then from the south, since the best time for bathing is from midday to evening. It should also be noted that the caldariums for women and men should be connected and placed in the same areas. For in this way it will be ensured that there is something common to both of them in the vases and hypocauses. Three bronze vessels should be arranged above the hypocauses, one caldarium, the other tepidarium, and the third frigidarium, and they should be placed in such a way that as much hot water as comes out of the tepidarium into the caldarium, it flows

de frigidario in tepidarium ad eundem modum, testudinesque alveolorum ex communi hypocausi calfaciantur.

from the frigidarium to the tepidarium in the same way, and the shells of the alveoli are heated from a common hypocausal.

The first place to be chosen is the warmest, that is, turned away from the north and the north-east. But the warm, hot rooms themselves should have west-west light, but if the nature of the place makes this difficult, then of course south-facing, because the time for washing is mainly from midday until night. And it must also be observed that the male and female heathers are joined and placed in the same regions; because in this way it will be done that both are common to the vessels and hypocausts. On the hypocaust three cauldrons will be arranged, a cauldron, a second hot one, a third cold one, and placed so that all the hot water that comes out of the cauldron flows from the cold to the warm

in the same way, and the domes of the alveoli are heated by the common hypocaust.

2. suspensurae caldariorum ita sunt faciendae ut primum sesquipedalibus tegulis solum sternatur inclinatum ad hypocausim, uti pila cum mittatur non possit intro resistere sed rursus redeat ad praefurnium ipsa per se. ita flamma facilius pervagabitur sub suspensione. supraque laterculis besalibus pilae struantur ita dispositae uti bipedales tegulae possint supra esse conlocatae. altitudinem autem pilae habeant pedes duo eaeque struantur argilla cum capillo subacta, supraque conlocentur tegulae bipedales quae sustineant pavimentum.

2. The suspensions of the boilers are to be made in such a way that first the floor is laid with half-foot tiles inclined towards the hypocausis, so that when the ball is thrown in it cannot resist but returns to the pre-furnace by itself. In this way the flame will spread more easily under the suspension. Above this, the pillars (pilae) are raised with small bessal bricks, arranged so that two-foot tiles can be placed above. The height of the balls, however, should be two feet, and they should be laid with clay with hair pressed down, and above them are placed two-foot tiles that support the floor.

Explanatory note — Bk. 5.10 (the baths and the hypocaust). Vitruvius gives the fullest ancient account of the Roman bath. The site is chosen as warm as possible, facing south and west; the men's and women's baths are set side by side to share a single furnace (praefurnium). The heating system is the hypocaust: the floor of the hot rooms —the suspensura— is raised on brick piers, leaving a chamber through which the hot air of the furnace circulates and then rises through clay pipes (tubuli) set in the walls. Over the hypocaust three bronze cauldrons —caldarium, tepidarium, and frigidarium— are placed and linked so that the water passes from the warm to the hot as it is drawn off. The bathwater is further heated in a bronze vessel called the testudo ('tortoise'), from its shape. Pompeian archaeology (the Forum Baths) confirms the scheme. The text has been collated with no variant affecting the sense.

Comparative note — Bk. 5.10 (baths). In the Budé, Book V is the work of Catherine Saliou (2009), whose commentary links the chapter with bath archaeology (Pompeii, Ostia) and with the improvement of the hypocaust attributed to Sergius Orata. Granger (Loeb) and Rowland–Howe (Cambridge, 1999) fix the terminology (suspensura, hypocausis, praefurnium, testudo alvei,

schola labri); Corso–Romano detail the proportions of the caldarium (5.10.4). This edition keeps the transmitted text and translates in its own voice. The manuscript tradition shows only minor spelling variants, without effect on the sense.

The suspensions (suspensurae) of the hot rooms will be made like this: first the floor will be paved with tiles of a foot and a half, inclined towards the hypocaust, so that, if a ball is thrown, it cannot remain inside, but returns by itself to the mouth of the furnace; thus the flame will spread more easily under the suspension of the floor.

3. concamarationes vero si ex structura factae fuerint, erunt utiliores, sin autem contignationes fuerint, figlinum opus subiciatur, sed hoc ita erit faciendum. regulae ferreae aut arcus fiant eaeque uncinis ferreis ad contignationem suspendantur quam creberrimis, eaeque regulae sive arcus ita disponantur uti tegulae sine marginibus sedere in duabus invehique possint, et ita totae concamarationes in ferro nitentes sint perfectae. earumque camararum superiora coagmenta ex argilla cum capillo subacta liniantur, inferior autem pars, quae ad pavimentum spectat, primum testa cum calce trullizetur, deinde opere albario sive tectorio poliatur. eaeque camarae in caldariis si duplices factae fuerint, meliorem habebunt usum. non enim a vapore umor corrumpere poterit materiem contignationis, sed inter duas camaras vagabitur.

3. If the chambers are made of a structure, they will be more useful, but if they are floors, then pottery work should be placed under them, but this should be done in this way. Iron rules or arches should be made and they should be hung on iron hooks as thick as possible to the floor, and these rules or arches should be arranged so that the tiles can sit without edges on two and can be driven in, and thus the entire chambers should be perfect, shining in iron. And the upper joints of their chambers should be lined with clay with hair, but the lower part, which looks to the floor, should first be troweled with clay and lime, then polished with whitewash or plaster. And if these chambers in the boilers are made double, they will have a better use. For the moisture from the steam will not be able to corrupt the material of the floor, but will wander between the two chambers.

However, if the chambers are structural, they will be more useful; but if there are floors, pottery work must be done. But this must be done. Let iron

rules or arches be made, and let these iron hooks be hung from the ground as thickly as possible; and let the rules or arches be arranged in such a way that the tiles can be laid without sharp edges on either side, and in this way all the vaults, supported on iron, will be perfect. And the upper parts of their chambers are covered with mud and covered with hair; and in the lower part, which faces the ground, the shell is first plastered with lime and then polished with albarium or roofing material. And these cauldron chambers, if made double, will be of better use; because the moisture will not be able to damage the floor material due to the steam, but will instead move between the two chambers.

4. magnitudines autem balneorum videntur fieri pro copia hominum, <dummodo> sint ita compositae. quanta longitudo fuerit, tertia dempta, latitudo sit praeter scholam labri et alvei. labrum utique sub lumine faciundum videtur, ne stantes circum suis umbris obscurent lucem. scholas autem labrorum ita fieri oportet spatiosas uti cum priores occupaverint loca, circum expectantes reliqui recte stare possint. alvei autem latitudo inter parietem et pluteum ne minus sit pedes senos, ut gradus inferior inde auferat et pulvinus duos pedes.

4. The sizes of the baths seem to be made according to the number of people, <provided> they are arranged in such a way. Whatever the length is, subtract a third, the width is to be in addition to the width of the basin and the basin. The basin certainly seems to be made under the light, so that those standing around it do not obscure the light with their shadows. The basins, however, must be made so spacious that when the first have taken their places, the rest, looking around, can stand upright. The width of the basin between the wall and the shelf should not be less than six feet, so that the lower step takes away from it and the cushion two feet.

But the grandeur of the baths seems made for the abundance of men; that they be thus composed. What is the length of the third cut, be it the width, besides the lip school and the channel? Of course, it seems that the border should be made under the light, so that the people who are around with their shadows do not obscure the light. But the lip schools must be so spacious, that when the first have occupied the places around them, the rest of the spectators can stand properly. But the width of the channel between the wall and the shelf

must not be less than two feet, so that the lower step and the cushion must be two feet from it.

5. laconicum sudationesque sunt coniungendae tepidario, eaeque quam latae fuerint, tantam altitudinem habeant ad imam curvaturam hemisphaerii. mediumque lumen in hemisphaerio relinquatur ex eoque clipeum aeneum catenis pendeat, per cuius reductiones et demissiones perficietur sudationis temperatura. ipsumque ad circinum fieri oportere videtur, ut aequaliter a medio flammae vaporisque vis per curvaturae rotundationes pervagetur.

5. The laconic and the tepidariums are to be connected, and however wide they are, they should have as much height to the lowest curvature of the hemisphere. And a central lumen should be left in the hemisphere and from it a brass cup should hang with chains, by the reductions and lowerings of which the temperature of the sweating will be perfected. And it seems necessary to make it like a compass, so that the force of the flame and vapors from the middle should spread evenly through the roundings of the curvature.

The laconic and the perspiration must be joined to the warmth; and however wide they may be, they must have a height such as the lowest curvature of the hemisphere. And let the medium of light remain in the hemisphere, and from it hang by chains a bronze shield, by whose reductions and discharges the temperature of perspiration will be reached. And it seems necessary to make a tray for a circle, so that the force of the center of the flame and the vapors may be distributed equally through the roundness of the curvature.

Editorial note. — Chapter 10 gives the earliest detailed account of the Roman bath. Its technical core is the hypocaust: the floor of the hot rooms is raised on small pillars of tile (suspensurae) so that the hot gases from a furnace (hypocausis) circulate beneath it and, through flues, up the walls; the bronze tanks (testudines alveolorum) are heated from the same source. Vitruvius prescribes the warm orientation (away from the cold north), the sequence of caldarium, tepidarium and frigidarium, and the domed sweating-room (laconicum) with its adjustable bronze disc. The vocabulary — suspensura, hypocausis, laconicum, alveus — is retained, with glosses, in the Glossarium and the Conspectus of Greek Terms.

Critical and constructional note — V.10. Caldaria, tepidaria, suspensurae, hypocaustum, praefurnium, alveus, laconicum and concamerata sudatio form

a coordinated bathing and heating system. The suspended pavement and its slope towards the furnace are explained in their constructional sequence. Convection and heat transfer can clarify the operation in a modern technical note, but the Latin is not recast as a contemporary specification for underfloor heating.

Chapter 11

1. *Nunc mihi videtur, tametsi non sint italicae consuetudinis palaestrarum aedificationes, traditae tamen explicare et quemadmodum apud Graecos constituantur monstrare. in palaestris peristylia quadrata sive oblonga ita sunt facienda uti duorum stadiorum habeant ambulationis circumitionem, quod Graeci vocant δίαυλον, ex quibus tres porticus simplices disponantur, quarta quae ad meridianas regiones est conversa, duplex, uti cum tempestates ventosae sint, non possit aspergo in interiorem partem pervenire.*

2. Now it seems to me that, even if they are not the buildings of the Italian custom of the gymnasiums, they should nevertheless explain the traditional ones and show how they are constructed among the Greeks. In the gymnasiums, square or oblong peristyles should be made so that they have a circumference of two stadia for walking, which the Greeks call δίαυλον, from which three simple porticos should be arranged, the fourth, which faces the southern regions, should be double, so that when there are windy storms, the spray cannot reach the inner part.

Now it seems to me that, although the construction of the palaestras is not of Italian custom, it is inherited, and I must explain it and show how it was arranged among the Greeks. In the palaestras, square or oblong peristyles must be made in such a way that they have a two-stage walking circuit, which the Greeks call a diaulon, of which three simple galleries are arranged; the fourth, which is oriented towards the southern regions, is double, so that when it is windy, one cannot get sputtered inside to reach the party.

2. constituantur autem in tribus porticibus exhedrae spatiosae, habentes sedes in quibus philosophi rhetores reliquique qui studiis delectantur sedentes disputare possint. in duplici autem porticu conlocentur haec membra. ephebeum in medio, hoc autem est exhedra amplissima cum sedibus, tertia parte longior sit quam lata. sub dextro coryceum, deinde proxime conisterium, a conisterio in versura porticus frigida lavatio, quam Graeci λουτρόν vocitant. ad sinistram ephebei elaeothesium, proxime autem elaeothesium <frigidarium>, ab eoque iter in propnigeum in versura porticus. proxima autem introrsus e regione frigidarii conlocetur concamerata sudatio longitudine duplex quam latitudo, quae habeat in versuris ex una parte laconicum ad eundem modum uti quam supra scriptum

est, compositum, ex adverso laconici caldam lavationem. in palaestra peristylia, quemadmodum supra scriptum est, ita debent esse [perfecta] distributa.

2. In the three porticos, spacious rooms should be set up, with seats in which philosophers, rhetoricians, and others who delight in studies can sit and debate. In the double portico, these members should be placed. The ephebeum in the middle, which is the largest exedra with seats, which is one-third longer than it is wide. On the right, the coryceum, then next to it, the conisterium, from the conisterium, in the turn of the portico, a cold bath, which the Greeks call λουτρόν. On the left, the ephebeum, the elaeothesium, and next to it, the elaeothesium, and from there a path to the propnigeum, in the turn of the portico. But next to it, inward, opposite the frigidarium, a conchamarata sweating room should be placed, twice as long as it is wide, which should have a laconic bath on one side in the turns in the same way as written above, and a hot bath on the opposite side of the laconic bath. In the palaestra, the peristyle, as written above, should be distributed in this way.

And in the three porticoes there must be spacious pavilions, with seats, where philosophers, orators, and others who enjoy learning can sit and debate. Now these members are placed in a double portico: the ephebeum in the middle (and this is the largest room with seats) must be one-third longer than it is wide; below the right-hand coryzeum, then next to the conisterium, from the conisterium around the portico a cold washroom, which the Greeks call the loutron; to the left of the ephebe the Elaeothesium, and next to the Elaeothesium the frigidarium, and from it the way to the propnigeum in the direction of the portico. Near the interior, next to the refrigerator, there is a sweat room with a chamber, twice as long as it is wide, which has a laconic line on one side, as described above, combined with a hot wash on the opposite side. In the gymnasium, the peristyles, as described above, must be perfectly distributed.

3. extra autem disponantur porticus tres, una ex peristylo exeuntibus, duae dextra atque sinistra stadiatae, ex quibus una quae spectaverit ad septentrionem, perficiatur duplex amplissima latitudine, altera simplex ita factae uti in partibus quae fuerint circa parietes et quae erit ad columnas, margines habeant uti semitas non minus pedum denûm mediumque excavatum uti gradus sint in descensu marginibus sesquipedem ad planitiem, quae planities sit non minus

pedes XII. ita qui vestiti ambulaverint circum in marginibus, non inpedientur ab unctis se exercentibus.

3. Outside, three porticos are to be arranged, one leading from the peristyle, and two on the right and left, of which one, which faces north, is to be completed as a double, with a very ample width, the other single, so made that in the parts which will be around the walls and which will be at the columns, the edges should be like paths of not less than ten feet and the middle should be excavated so that there are steps in the descent from the edges, one half-foot to the plain, which plain should be no less than twelve feet. Thus, those who walk around the edges dressed will not be hindered by the anointed exercising themselves.

Outside there are arranged three porticoes, one leading out from the peristyle, two stades to the right and left, of which one, facing north, will be completed with double width, the other single, made in such a way that in the parts that have been around the walls and that will be at the columns, they have edges in the form of paths no less than one foot long and half excavated, there are steps on the descent at the edges of half a foot to the level, which should not be less than twelve feet, so that those who walk clothed along the edges are not hindered by the anointed ones who are exercising.

4. haec autem porticus ξυστός apud Graecos vocitatur, quod athletae per hiberna tempora in tectis stadiis exercentur. proxime autem xystum et duplicem porticum designentur hypaethroe ambulationes, quas Graeci παραδρομίδες, nostri xysta appellant, in quas per hiemem ex xysto sereno caelo athletae prodeuntes exercentur. faciunda autem xysta sic videntur ut sint inter duas porticus silvae aut platanones et in his perficiantur inter arbores ambulationes ibique ex opere signino stationes. post xystum autem stadium ita figuratum ut possint hominum copiae cum laxamento athletas certantes spectare. Quae in moenibus necessaria videbantur esse ut apte disponantur, perscripsi.

4. This portico is called the ξυστός among the Greeks, because athletes exercise in covered stadia during the winter months. Next to the xystum and the double portico are designated the hypaethroe walks, which the Greeks call παραδρομίδας, ours xysta, in which athletes, coming out of the xystum in clear weather, exercise during the winter. The xystum is made in such a way that there are forests or plane trees between the two porticos and in these walks are made between the trees and there are stations according to the work I design. After the

xystum is the stadium, so shaped that crowds of people can watch the athletes competing with ease. I have written down what seemed to be necessary in the walls to be arranged appropriately.

But among the Greeks, this portico the Greeks call the xystus (ξυστός), because the athletes train in covered stadia during the winter season. Beside the terrace and the double portico, the hyper-atreous walkways will be designated, which the Greeks call paradromids, our terrace, where during the winter the athletes train, emerging from the terrace under clear skies. Now the posts will be erected so that there are wooden beams or plane trees between the two galleries, and in these the walkways will end among the trees, and there will be work stations for the sign. And behind the terrace there was a stadium so that the crowd could calmly watch the athletes compete. I noted what seemed necessary on the walls, so that they would be well arranged.

Critical and typological note — V.11. Vitruvius states that palaestrae do not belong to the Italic custom before describing their Greek arrangement. Peristylium, exhedrae, ephebeum, coryceum, conisterium, frigida lavatio, elaothesium, propnigeum, ξυστός and παραδρομίδες retain their specific functions. The double portico, covered xystus and open walks must be distinguished. The two-stadium peristyle and other ancient dimensions are not silently replaced by modern equivalents; the normative account is not a universal plan of Hellenistic gymnasia.

Chapter 12

1. *de opportunitate autem portuum non est praetermittendum, sed quibus rationibus tueantur naves in his ab tempestatibus explicandum. hi autem naturaliter si sint bene positi habeantque acroteria sive promunturia procurrentia, ex quibus introrsus curvaturae sive versurae ex loci natura fuerint conformatae, maximas utilitates videntur habere. circum enim porticus sive navalia sunt facienda sive ex porticibus aditus ad emporia, turresque ex utraque parte conlocandae, ex quibus catenae traduci per machinas possint.*

2. The suitability of harbors must also be considered, together with the means of protecting ships from storms. Natural sites offer great advantages when projecting headlands form inward-curving bays or sheltered angles. Build porticoes or shipyards around them, with access from the porticoes to the trading facilities. Place towers on both sides of the entrance, from which chains can be drawn across by machinery.

Technical paraphrase of 5.12.1. Vitruvius favors naturally sheltered harbors enclosed by projecting headlands. Their shores require porticoes, shipyards, and access to commercial premises; towers on either side allow a chain to be drawn across the entrance. The porticus are colonnaded structures, not lifting gantries.

2. Sin autem non naturalem locum neque idoneum ad tuendas ab tempestatibus naves habuerimus, ita videtur esse faciendum uti si nullum flumen in his locis inpedierit sed erit ex una parte statio, tunc ex altera parte structuris sive aggeribus expediantur progressus. et ita conformandae portuum conclusiones. eae autem structurae quae in aqua sunt futurae, videntur sic esse faciendae uti portetur pulvis a regionibus quae sunt a Cumis continuatae ad promunturium Minervae, isque misceatur uti in mortario duo ad unum respondeant.

2. If there is no natural site suitable for sheltering ships from storms, proceed as follows. Where no river obstructs the site and there is an anchorage on one side, extend masonry works or embankments from the other to form the harbor enclosure. For structures to be built in water, bring volcanic powder from the region extending from Cumae to the

promontory of Minerva and mix it into mortar in a ratio of two parts powder to one part lime.

Technical paraphrase of 5.12.2. An artificial enclosure can supplement a site that lacks natural shelter: extend the mole or embankment from the opposite side of the anchorage. For underwater construction, Vitruvius prescribes the volcanic powder of the Bay of Naples, mixed at two parts to one of lime.

3. deinde tunc in eo loco qui definitus erit, arcae stipitibus robusteis et catenis inclusae in aquam demittendae destinandaeque firmiter, deinde inter ea extrastilis inferior pars sub aqua exaequanda et purganda, et caementis ex mortario, materia mixta quemadmodum supra scriptum est, ibi congerendum, doneque compleatur structurae spatium quod fuerit inter arcas. hoc autem munus naturale habent ea loca quae supra scripta sunt. Sin autem propter fluctus aut impetus aperti pelagi destinae arcas non potuerint continere, tunc ab ipsa terra sive crepidine pulvinus quam firmissime struatur, isque pulvinus exaequata struatur planitia minus quam dimidiae partis, reliquum quod est proxime litus, proclinatum latus habeat.

3. Then, in the place that will be determined, the caissons (arcae), framed with stout posts and chains, are to be lowered into the water and firmly placed, then the lower part inside the water is to be leveled and cleaned with the help of the ladles, and rubble and mortar, the material mixed as described above, are to be piled there, until the structure is completed, filling the space between the arks. Now, the places described above have this natural function. But if, due to waves or the force of the open sea, the arks cannot be contained, then a cushion is to be built as firmly as possible from the land itself or from the shore, and this cushion, when leveled, is to be built so that less than half of the surface is level, the remainder, which is closest to the shore, has a sloping side.

Explanatory note — Bk. 5.12 (harbors and hydraulic concrete). The last chapter of Book V treats harbor construction, which Vitruvius grounds in an extraordinary material: the pulvis Puteolanus —pozzolana, the volcanic ash of Puteoli (Pozzuoli), in the Campi Flegrei of the Bay of

Naples—, already described in 2.6. Mixed with lime (two parts pozzolana to one of lime for underwater work), it sets under seawater and gains extraordinary hardness and durability. With it the pilae are cast, large concrete masses for moles and breakwaters. Where no naturally sheltered site exists, Vitruvius describes the cofferdam (arca) method: an enclosure of stout piles (stipites) and chains, driven into the seabed, from which the water is bailed out so that the mortar and rubble can be poured in. It is the most detailed ancient testimony on Roman maritime engineering. The text has been collated with no variant affecting the sense.

Comparative note — Bk. 5.12 (harbour works). Saliou's Budé (2009) comments on the chapter in the light of harbour archaeology; the passage is collated with 2.6 (where pozzolana is described) and with Strabo (5.4.6), Seneca, and Pliny, who confirm the Puteolan origin of the material. Granger (Loeb) and Rowland–Howe (Cambridge, 1999) discuss the interpretation of Vitruvius's three methods, made difficult by the loss of the original diagrams. The decisive novelty is modern experimental verification: the ROMACONS project (Oleson, Hohlfelder, Brandon, Jackson; Building for Eternity, 2014) drilled ancient harbour concretes and cast a pila by the Vitruvian formula at Brindisi (2004), confirming its underwater set and a curing of about twelve months. This edition follows Rose's text and translates in its own voice.

Then, at the designated place, the caisson (arca), framed with stout posts and chains, will be lowered into the water and firmly secured. The bottom between these blocks must then be leveled and cleaned underwater, and the rubble mixed with mortar, as described above, must be piled there until the space between the boxes is filled. This is the natural function of the places mentioned earlier.

But if, due to waves or storms, the open ocean could not contain the planned arks, then a mattress should be built as firm as possible from the land or the shore itself, and the mattress should be leveled with a plain of less than half the surface. This, and the rest, which is closer to the shore, should have one sloping side.

4. deinde ad ipsam aquam et latera pulvino circiter sesquipedales margines struantur aequilibres ex planitia quae est supra scripta, tunc proclinatio ea impleatur harena et exaequetur cum margine et planitia pulvini. deinde insuper eam exaequationem pila quam magna constituta fuerit ibi struatur, eaque cum erit extructa, relinquatur ne minus duos menses ut siccescat. tunc autem succidatur margo quae sustinet harenam. ita harena fluctibus subruta efficiet in mare pilae praecipitationem. hac ratione quotienscumque opus fuerit, in aquam poterit esse progressus.

4. Then, to the water itself and the sides of the cushion, margins of about one and a half feet are built, equal to the level described above. Then, that slope is filled with sand and made equal to the edge and level of the cushion. Then, on top of that leveling, a large pile is built there, and when it is built, it is left for at least two months to dry. Then, however, the edge that supports the sand is cut away. Thus, the sand, crushed by the waves, will cause the pile to precipitate into the sea. In this way, whenever necessary, it will be possible to advance into the water.

Next, up to the water level itself and towards the sides of the cushion, margins of about one and a half feet should be built, balanced from the level indicated above; then this slope should be filled with sand and leveled with the edge and level of the cushion. Then, the leveling ball that has been installed should be placed there; and when it is built will be left Let it dry for at least two months. Then cut the margin holding the sand; this way, the sand broken by the waves will cause the ball to fall into the sea. In this way, as many times as necessary, it will be possible to advance in the water.

5. In quibus autem locis pulvis non nascitur, his rationibus erit faciendum uti arcae duplices relatis tabulis et catenis conligatae in eo loco qui finitus erit constituantur, et inter destinas creta in aeronibus ex ulva palustri factis calcetur. cum ita bene calcatum et quam densissime fuerit, tunc cocleis rotis tympanis conlocatis locus qui ea saeptione finitus fuerit exinaniatur sicceturque, et ibi inter saeptiones fundamenta fodiantur. si terrena erunt, usque ad solidum crassiora quam qui murus supra futurus erit, et tunc structura ex caementis calce et harena compleantur.

5. In places where pozzolana (pulvis) is not found, it will be necessary to do this by placing double caissons, tied together with burnt sticks and

chains, in the place that will be finished, and between the designated places, chalk will be trampled in aerofoils made of marsh bulrush. When it has been trampled well and as densely as possible, then with augers and drum wheels placed, the place that will be finished with that partition will be emptied and dried, and there between the partitions the foundations will be dug. If they will be earthen, they will be emptied and dried until solid, thicker than the wall that will be above, and then the structure will be completed with rubble, lime, and sand.

But in those places where pozzolana (pulvis) is not found, it shall be done in this way, as if double caissons were placed, tied with boards and chains, in the place to be finished, and chalk shall be placed between the designated areas, wedged in place with wedges made of marsh holly. When it has been thus well trodden and as densely as possible, then the space enclosed by that partition, after it has been placed with drum wheels, is emptied and dried, and there the foundations are excavated between the partitions. If they are of earth, even solid earth, thicker than the wall above, they shall be emptied and dried, and then the structure shall be filled with rubble, lime, and sand.

6. sin autem mollis locus erit, palis ustilatis alneis aut oleagineis configantur et carbonibus compleantur, quemadmodum in theatrorum et muri fundationibus est scriptum. deinde tunc quadrato saxo murus ducatur iuncturis quam longissimis, uti maxime medii lapides coagmentis contineantur. tunc qui locus erit inter murum ruderatione sive structura compleatur. ita erit uti possit turris insuper aedificari.

6. But if the place is soft, it is to be driven with piles of charred alder or olive-wood and packed with charcoal, as is written in the foundations of theaters and walls. Then the wall is to be built with squared stone with the joints as long as possible, so that the middle stones are held together with mortar. Then whatever space there is between the wall is to be filled with rubble or masonry. It will be so that a tower can be built on top.

But if the ground is soft, the piles shall be of charred alder or olive-wood, packed with charcoal, as is written on the foundations of theaters and on

walls. Next, the wall is laid out with a square stone at the longest possible joints, so that the intervening stones remain mostly in place. Then, the space between the stones in the wall should be filled with rubble or masonry. This will make it possible to build a tower on top.

7. His perfectis navaliorum ea erit ratio ut constituantur spectantia maxime ad septentrionem. nam meridianae regiones propter aestus cariem tineam teredines reliquaque bestiarum nocentium genera procreant alendoque conservant, eaque aedificia minime sunt materianda propter incendia. de magnitudinibus autem finitio nulla debet esse, sed faciunda ad maximum navium modum, uti etsi maiores naves subductae fuerint, habeant cum laxamento ibi conlocationem. Quae necessaria ad utilitatem in civitatibus publicorum locorum succurrere mihi potuerunt, quemadmodum constituantur et perficiantur in hoc volumine scripsi, privatorum autem aedificiorum utilitates et eorum symmetrias insequenti volumine ratiocinabor

7. When these are completed, the plan for the shipyards will be to build those facing mainly to the north. For the southern regions, because of the heat, breed and nourish moths, beetles, and other kinds of harmful animals, and those buildings should be least materialized because of fires. There should be no limitation on the sizes, but the maximum size of the ships should be made, so that even if larger ships are removed, they can still be accommodated there with ease. I have written in this volume how these necessary utilities in the cities of public places can be of assistance to me, but I will discuss the utilities and their symmetries of private buildings in the following volume.

Textual note — Book V. The running Latin is checked against Krohn (1912). The preface's reference to cubicis rationibus and CCXVI versus belongs to the organization of technical writing; the author's wider cubic interpretation is developed separately in the preliminary study. Greek harmonic vocabulary is retained in the discussion of sound and sounding vessels. These checks do not constitute a new complete collation of the apparatuses of Rose, Granger or Budé.

Editorial note. — Chapter 12 preserves the fullest ancient account of building in the sea. Where a natural harbour is wanting, Vitruvius describes a hydraulic mortar of lime and the volcanic ash of Puteoli (pulvis Puteolanus, pozzolana) that sets under water; it is poured within timber caissons (arcae) sunk and braced

on the sea-bed, or, on soft ground, on a platform of charred alder and olive piles packed with charcoal. This is the technique behind the great Roman maritime works — Portus, Caesarea Maritima — and modern coring of those moles has confirmed Vitruvius's recipe with remarkable exactness. The shipyards (navalia) are then set facing north, away from the heat that breeds rot and woodworm.

Once these are completed, the reason for the naval bases will be that they should be built especially towards the north; because the southern regions, due to the summer heat, breed and harbour rust, moths, mosquitoes, and other kinds of harmful creatures. And these buildings will not be completed because of fires. Now, there should be no limit as to size, but it should be limited to the maximum size of the ships, so that even if the largest ships are towed, they can be safely accommodated there.

I have written in this volume what things were necessary for the benefit of the states of public places, how they should be established and completed; and the advantages of private buildings and their symmetries I will consider in the next volume.

Argumentum Libri VI — *On the private house: the influence of climate and latitude on the arrangement of buildings, the proportions of atriums, tablinums, peristyles and triclinia, the differences between the Greek and Roman house, and the suitability (decor) of each room to its use and the condition of its owner.*

Notice. *— Book VI treats the private house. After a preface on the worth of learning above fortune, it relates domestic architecture to climate and latitude, sets out the proportions of the atrium, tablinum, peristyle and the several oeci, distinguishes the Greek house from the Roman, and turns to the working farmstead (villa rustica). It closes with the principles of sound construction — foundations, retaining walls and substructures. The book is the chief ancient evidence for the Roman domus and its social use of space.*

Critical and engineering note — V.12. The harbour chapter distinguishes natural shelter from artificial works. Pilae, moles, structurae and arcae are retained where needed to clarify the construction sequence. Underwater setting is linked to the pulvis of Cumae and Puteoli discussed in Book II. Modern explanations of pozzolanic chemistry belong in commentary. Archaeological

comparisons with cofferdams and harbour masses remain separate from the ancient prescription and do not supply missing levels or dimensions.

M. VITRVVIVS POLLIO · DE ARCHITECTVRA · LIBER VI

Preface

1. *Aristippus philosophus Socraticus naufragio cum eiectus ad Rhodiensium litus animadvertisset geometrica schemata descripta, exclamavisse ad comites ita dicitur bene speremus, hominum enim vestigia video statimque in oppidum Rhodum contendit et recta gymnasium devenit, ibique de philosophia disputans muneribus est donatus, ut non tantum se ornaret sed etiam eis qui una fuerunt et vestitum et cetera quae opus essent ad victum praestaret. cum autem eius comites in patriam reverti voluissent interrogarentque eum quidnam vellet domum renuntiari, tunc ita mandavit dicere, eiusmodi possessiones et viatica liberis oportere parari quae etiam e naufragio una possent enatare.*

2. Aristippus, the Socratic philosopher, shipwrecked and cast ashore on the coast of Rhodes, noticed geometrical figures drawn in the sand and is said to have cried out to his companions: "Let us be of good hope, for I see the traces of men." He made at once for the city of Rhodes and went straight to the gymnasium, where, discoursing on philosophy, he was rewarded with gifts so generous that he could provide not only for himself but also for those who were with him, with clothing and everything else needed for life. When his companions wished to return home and asked what message he would have them carry back, he bade them say this: that children ought to be furnished with such possessions and such provisions for the journey as could swim ashore with them even from a shipwreck.

3. *Editorial note.* — The anecdote of Aristippus opens Book VI as a meditation on the *vera praesidia vitae*, the true provisions of life: those goods — learning and character — that survive even shipwreck, where fortune cannot. Vitruvius develops the theme through Theophrastus and Epicurus, and the cry "I see the traces of men" became a favorite humanist commonplace for the civilising power of the liberal arts.

It is said that the Socratic philosopher Aristippus, cast ashore on the coast of Rhodes by a shipwreck, noticed geometrical diagrams traced in the sand and exclaimed to his companions: "Take heart! I see the footprints of men." He went at once to the city of Rhodes and straight to the gymnasium, where his

discourses on philosophy earned him gifts enough to provide not only for himself but also for the clothing and other needs of his companions. When they wished to return home and asked what message he would send, he told them to say that children should be given only such possessions and provisions as could swim to safety with them from a shipwreck. Philological note: *bene speremus* is rendered "Take heart!" to convey the exhortation to courage and hope; cf. Vitruvius, *De architectura* 6, praef. 1; Rowland and Howe 1999, 73; Granger, Loeb, vol. II (1934), 3.

2. namque ea vera praesidia sunt vitae quibus neque fortunae tempestas iniqua neque publicarum rerum mutatio neque belli vastatio potest nocere. non minus eam sententiam augendo Theophrastus, hortando doctos potius esse quam pecuniae confidentes ita ponit, doctum ex omnibus solum neque in alienis locis peregrinum neque amissis familiaribus et necessariis inopem amicorum sed in omni civitate esse civem difficilesque fortunae sine timore posse despicere casus, at qui non doctrinarum sed felicitatis praesidiis putaret se esse vallatum, labidis itineribus vadentem non stabili sed infirma conflictari vita.

For these are the true safeguards of life: neither the adverse storms of fortune, nor upheavals in public affairs, nor the devastation of war can harm them. Theophrastus develops the same idea, urging people to become learned rather than to put their trust in wealth. The educated person alone is not a stranger in foreign lands or left without friends when family and companions are lost; in every city such a person is a citizen and can face the hazards of fortune without fear. By contrast, one who trusts in good luck rather than learning walks on slippery paths and struggles through a fragile, uncertain life.

These, then, are the true protections of life, beyond the reach of adversity, political upheaval or war. Theophrastus extends the point: learning, not wealth, is the more secure resource. A learned person remains at home even abroad and is not deprived of friendship by the loss of relatives; the person who relies on fortune rather than knowledge lives precariously.

3. Epicurus vero non dissimiliter ait pauca sapientibus fortunam tribuere, quae autem maxima et necessaria sunt, animi mentisque cogitationibus gubernari. haec ita etiam plures philosophi dixerunt. non minus poetae qui antiquas comoedias graece scripserunt, easdem sententias versibus in scaena pronuntiaverunt, ut Crates Chionides Aristophanes, maxime etiam cum his

Alexis, qui Athenienses ait oportere ideo laudari quod omnium Graecorum leges cogunt parentes <ali> a liberis, Atheniensium non omnes nisi eos qui liberos artibus erudissent. omnia enim munera fortunae cum dantur ab ea faciliter adimuntur, disciplinae vero coniunctae cum animis nullo tempore deficiunt, sed permanent stabiliter ad summum exitum vitae.

Epicurus likewise says that fortune grants the wise relatively little, whereas the greatest and most necessary matters are governed by thought and judgment. Many other philosophers held the same view. The authors of ancient Greek comedy — Crates, Chionides, Aristophanes and, above all, Alexis — expressed similar ideas on stage. Alexis praises the Athenians because, whereas Greek laws generally require children to support their parents, the Athenians impose that duty only in respect of parents who have taught their children an art. Fortune may take away everything it has given; learning, once joined to the mind, remains steadfast to the end of life.

Epicurus makes a similar argument: fortune bestows few benefits on the wise, while the greatest needs are governed by the mind. The comic poets Crates, Chionides, Aristophanes and Alexis expressed the same principle. Alexis praised the Athenians for requiring children to support only those parents who had provided them with training in the arts, rather than imposing that obligation without distinction. Fortune's gifts may be lost; education remains with us throughout life.

4. itaque ego maximas infinitasque parentibus ago atque habeo gratias, quod Atheniensium legem probantes me arte erudiendum curaverunt, et ea quae non potest esse probata sine litteratura encyclioque doctrinarum omnium disciplina. cum ergo et parentium cura et praeceptorum doctrinis auctas haberem copias disciplinarum, philologis et philotechnis rebus commentariorumque scripturis me delectans eas possessiones animo paravi, e quibus haec est fructuum summa, nullas plus habendi esse necessitates eamque esse proprietatem divitiarum maxime, nihil desiderare. sed forte nonnulli haec levia iudicantes putant eos esse sapientes qui pecunia sunt copiosi. itaque plerique ad id propositum contendentes audacia adhibita cum divitiis etiam notitiam sunt consecuti.

4. I therefore give and owe the greatest, indeed boundless, thanks to my parents, who, approving the law of the Athenians, took care that I should be trained in an art, and in one that cannot be mastered without letters and the encyclopedic

education that embraces all the disciplines. Having thus enlarged my store of learning through my parents' care and my teachers' instruction, and delighting in literary and technical studies and in the writing of treatises, I acquired for my mind possessions whose chief fruit is this: that one has no need to possess more, and that the truest property of wealth is to desire nothing. Some, perhaps, think these things of little account and hold that the wise are those who abound in money. Many, therefore, pursuing that aim with boldness, have won notoriety together with riches.

I am therefore boundlessly grateful to my parents, who, endorsing the Athenian law, had me trained in an art — one that cannot be practised without letters and a general education in all the disciplines. Enriched by their care and by my teachers' instruction, and taking pleasure in literature, the arts and the writing of commentaries, I laid up possessions of the mind whose principal reward is to need nothing more: the greatest wealth is to desire nothing. Some, perhaps, think this trivial and count only the rich as wise; and many who have pursued riches with audacity have gained fame along with them.

5. ego autem, Caesar, non ad pecuniam parandam ex arte dedi studium, sed potius tenuitatem cum bona fama quam abundantiam cum infamia sequendam probavi. ideo notities parum est adsecuta. sed tamen his voluminibus editis, ut spero, etiam posteris ero notus. neque est mirandum quid ita pluribus sim ignotus. ceteri architecti rogant et ambiunt ut architectent, mihi autem a praeceptoribus est traditum rogatum non rogantem oportere suscipere curam, quod ingenuus color movetur pudore petendo rem suspiciosam. nam beneficium dantes non accipientes ambiuntur. quid enim putemus suspicari qui rogetur de patrimonio sumptus faciendos committere gratiae petentis, nisi praedae compendiique eius causa iudicet faciundum?.

5. I, however, Caesar, have not applied myself to making money by my art; I have preferred slender means with a good name to abundance with disrepute. For this reason I have gained little renown. Yet, now that these volumes are published, I hope to be known even to posterity. Nor should it surprise anyone that I am unknown to so many. Other architects solicit and canvass for commissions; but I was taught by my masters that one should undertake a charge when asked, not by asking, because a freeborn man's complexion is changed by shame when he petitions for something that arouses suspicion. For

it is those who confer a favor who are courted, not those who receive it. What, then, are we to suppose a man suspects when he is asked to entrust the spending of his patrimony to the goodwill of a petitioner, if not that the petitioner judges the work worth doing for his own plunder and profit?

I, for my part, Caesar, have never pursued my art for gain; I have preferred modest means with an honest name to wealth with dishonour. Hence my limited fame — though I trust these volumes will make me known to posterity. Nor is it surprising that I remain unknown to many. Other architects beg and canvass for work; my teachers taught me to accept a commission when invited, never to solicit it, since an honorable man blushes to ask for something that invites suspicion. Favors are sought from those who give, not from those who receive. What else would a client suspect, when asked to place his fortune at a petitioner's disposal, than that the petitioner seeks his own gain?

6. itaque maiores primum a genere probatis operam tradebant architectis, deinde quaerebant si honeste essent educati, ingenuo pudori non audaciae protervitatis permittendum iudicantes. ipsi autem artifices non erudiebant nisi suos liberos aut cognatos et eos viros bonos instituebant, quibus tantarum rerum fidei pecuniae sine dubitatione permitterentur. Cum autem animadverto ab indoctis et inperitis tantae disciplinae magnitudinem iactari et ab îs qui non modo <> architecturae sed omnino ne fabricae quidem notitiam habent, non possum non laudare patres familiarum eos qui litteraturae fiducia confirmati per se aedificantes ita iudicant, si inperitis sit committendum, ipsos potius digniores esse ad suam voluntatem quam ad alienam pecuniae consumere summam.

6. Our predecessors therefore entrusted building works first to architects whose family standing had been tested, and then enquired whether they had received an honorable education. They judged that responsibility should rest with the restraint of a freeborn man, rather than the audacity of the shameless. Craftsmen themselves trained only their sons or relatives, forming them as upright men to whose integrity funds for important works could safely be entrusted. Yet when I see so great a discipline handled at the whim of the uneducated and inexperienced, including men who know neither architecture nor even the craft of building, I cannot but commend those householders who, trusting in their literary education, build for themselves. If the work must be

entrusted to the inexperienced, they judge themselves more entitled to spend their money according to their own judgment than according to someone else's.

Our ancestors, therefore, entrusted their works first to architects of proven family, and then enquired whether they had been honorably brought up, judging that trust should be placed in the modesty of a freeborn man rather than in the audacity of the impudent. The craftsmen themselves taught none but their own sons or kinsmen, and formed them as men of integrity, to whose good faith money for works of such importance could be entrusted without hesitation.

Vitruvius's argument turns on professional trust and the management of a patron's money. His criticism of untrained practitioners explains his qualified approval of householders who undertake their own building when competent architects are unavailable.

7. itaque nemo artem ullam aliam conatur domi facere, uti sutrinam fullonicam aut ex ceteris quae sunt faciliores, nisi architecturam, ideo quod qui profitentur non arte vera sed falso nominantur architecti. quas ob res corpus architecturae rationesque eius putavi diligentissime conscribendas, opinans munus omnibus gentibus non ingratum futurum. igitur quoniam in quinto de opportunitate communium operum perscripsi, in hoc volumine privatorum aedificiorum ratiocinationes et commensus symmetriarum explicabo.

7. Thus no one attempts to practise any other art at home — shoemaking, fulling or any of the other easier crafts — except architecture, because those who profess it are called architects not by virtue of true art but falsely. For these reasons I judged that the body of architecture and its principles should be set down with the utmost care, believing that this would be a service not unwelcome to all peoples. Accordingly, since in the fifth book I have written of the fitness of public works, in this volume I shall set out the principles of private buildings and the commensurability of their proportions.

So no one tries to practise any other craft at home — cobbling, fulling or any easier trade — except architecture, because its practitioners bear the name of architect without possessing the true art. That is why I resolved to set out the whole body of architecture and its principles with the greatest care, in the belief that the work would be welcome to every nation. Having treated the fitness of

public works in the fifth book, I shall explain in this one the principles and proportional systems of private buildings.

Critical note — VI, preface. The philosophical and biographical exempla contrast fortune with disciplined education and support an ethical account of professional formation. They are part of Vitruvius's moral self-presentation; rhetorical examples do not become independent biographical documentation merely because they occur in the preface.

Chapter 1

1. *Haec autem ita erunt recte disposita, si primo animadversum fuerit quibus regionibus aut quibus inclinationibus mundi constituantur. namque aliter Aegypto, aliter Hispania, non eodem modo Ponto, dissimiliter Romae, item ceteris terrarum et regionum proprietatibus oportere videntur constitui genera aedificiorum, quod alia parte solis cursu premitur tellus, alia longe ab eo distat, alia per medium temperatur. igitur uti constitutio mundi ad terrae spatium inclinatione signiferi circuli et solis cursu disparibus qualitatibus naturaliter est conlocata, ad eundem modum etiam ad regionum rationes caelique varietates videntur aedificiorum debere dirigi conlocationes.*

2. These buildings will be rightly disposed if attention is first paid to the regions and latitudes of the world in which they are set. For it seems that the kinds of building ought to be constituted in one way in Egypt, in another in Spain, not in the same way in Pontus, differently at Rome, and so on according to the properties of other lands and regions; for in one part the earth is oppressed by the course of the sun, in another it lies far from it, and in another it is tempered by an intermediate position. Therefore, just as the constitution of the heavens in relation to the extent of the earth is naturally disposed with unequal qualities by the inclination of the zodiac and the course of the sun, so the disposition of buildings ought likewise to be governed by the character of each region and the variety of its climate.

Buildings will be properly arranged if we first consider the region and the latitude in which they stand. Houses must evidently be built in one way in Egypt, in another in Spain, otherwise in Pontus, differently again at Rome, and so on according to the character of each land: in some places the earth lies under the full force of the sun, in others it is far removed from it, and in others it is tempered by a middle position. As the heavens are naturally arranged with unequal qualities over the earth, by the inclination of the zodiac and the course of the sun, so the disposition of buildings must follow the nature of each region and the variety of its climate.

2. sub septentrione aedificia testudinata et maxime conclusa et non patentia sed conversa ad calidas partes oportere fieri videntur. contra autem sub impetu solis meridianis regionibus, quod premuntur a calore, patentiora conversaque ad septentrionem et aquilonem sunt faciunda. ita quod ultra natura laedit, arte erit

emendandum. item reliquis regionibus ad eundem modum <debet> temperari, quemadmodum caelum est ad inclinationem mundi conlocatum.

2. In the north, it seems, buildings should be vaulted, closed in as much as possible rather than open, and turned towards the warm quarters. In southern regions, on the contrary, which lie under the full force of the sun and are oppressed by its heat, they should be built more open and turned towards the north and north-east. Thus what nature harms by excess must be corrected by art. In the other regions, too, buildings must be tempered in the same way, according to how the climate is disposed in relation to the inclination of the world.

In northern lands buildings should be vaulted and closely enclosed, not open, and should face the warm quarters. In the south, where the sun beats down and the heat is oppressive, they should be more open and face the north and north-east. What nature spoils by excess, art must correct; and elsewhere, too, building must be adjusted to the climate as it is determined by the inclination of the heavens.

3. Haec autem ex natura rerum sunt animadvertenda et consideranda atque etiam ex membris corporibusque gentium observanda. namque sol quibus locis mediocriter profundit vapores, in his conservat corpora temperata, quaeque proxime currendo deflagrat, eripit exurendo temperaturam umoris. contra vero refrigeratis regionibus, quod absunt a meridie longe, non exhauritur a caloribus umor, sed ex caelo roscidus aer in corpora fundens umorem efficit ampliores corporaturas vocisque sonitus graviores. ex eo quoque quae sub septentrionibus nutriuntur gentes inmanibus corporibus, candidis coloribus, directo capillo et rufo, oculis caesis, sanguine multo ab umoris plenitate caelique refrigerationibus sunt conformati.

3. These matters are to be observed and considered from the nature of things, and also studied in the limbs and bodies of peoples. For where the sun pours out its heat in moderation, it keeps bodies temperate; where it runs close and scorches, it burns away their due proportion of moisture; in cold regions, on the other hand, which lie far from the south, moisture is not drawn off by heat, but the dewy air, pouring moisture from the sky into bodies, produces larger frames and deeper voices. Hence, too, the peoples reared under the north are formed with huge bodies, fair complexions, straight red hair, gray-blue eyes and

abundant blood, because of the fullness of moisture and the coldness of the climate;

These things should be judged from nature itself and observed in the physique of different peoples. Where the sun gives out its heat moderately, it keeps bodies temperate; where it passes close by, it parches them and destroys their balance of moisture. In cold regions far from the south, by contrast, the heat does not exhaust the moisture; the dewy air of the sky saturates bodies and produces larger stature and deeper voices. That is why the northern peoples are tall and fair-skinned, with straight red hair, gray-blue eyes and plentiful blood, owing to the abundance of moisture and the coolness of the climate.

4. qui autem sunt proximi ad axem meridianum subiectique solis cursui, brevioribus corporibus, colore fusco, crispo capillo, oculis nigris, cruribus validis, sanguine exiguo solis impetu perficiuntur. itaque etiam propter sanguinis exiguitatem timidiores sunt ferro resistere, sed ardores ac febres sufferunt sine timore, quod nutrita sunt eorum membra cum fervore. itemque corpora quae nascuntur sub septentrione a febri sunt timidiora et inbecilla, sanguinis autem abundantia ferro resistunt sine timore.

4. those, on the other hand, who live nearest to the southern pole and beneath the course of the sun are formed by its force with shorter bodies, dark complexions, curly hair, black eyes, strong legs and little blood. Hence, because of the scarcity of their blood, they are more afraid of resisting the sword, but they endure heat and fevers without fear, since their limbs have been nourished in heat; whereas bodies born under the north are more fearful of fever and weaker against it, but, owing to the abundance of their blood, they resist the sword without fear.

Those who live nearer the southern axis, beneath the sun's course, are shaped by its force into shorter frames, with dark skin, curly hair, black eyes, strong legs and little blood. Their scant blood makes them reluctant to face the sword, but they bear heat and fever fearlessly, since their limbs were reared in warmth. Northerners, by contrast, are vulnerable and fearful in fever, but their abundant blood allows them to face the sword without fear.

5. Non minus sonus vocis in generibus gentium dispares et varias habet qualitates, ideo quod terminatio orientis et occidentis circa terrae librationem, qua dividitur pars superior et inferior mundi, habere videtur libratam naturali modo

circumitionem, quam etiam mathematici ὁρίζοντα dicunt. igitur cum id habemus certum ab imo sustinens, ab labro quod est in regione septentrionali, linea traiecta ad id quod est supra meridianum axem ab eoque altera obliqua in altitudinem ad summum cardinem qui est post stellas septentrionum, sine dubitatione animadvertemus ex eo esse schema trigonii mundo, uti organi quam σαμβύκη graeci dicunt.

5. No less does the sound of the voice have unequal and varied qualities among the different kinds of peoples, because the boundary of east and west around the level of the earth, by which the upper and lower parts of the world are divided, appears to have a circuit naturally leveled, which the mathematicians also call ὁρίζων, the horizon. Taking this as certain, if a line is drawn from the edge in the northern region to the edge above the southern axis, and from there another line obliquely upwards to the highest pole, behind the stars of the Bear, we shall perceive without doubt that the world thereby has the figure of a triangle, like that of the instrument the Greeks call σαμβύκη, the sambuca.

The sound of the voice, too, differs in quality from one people to another. The boundary between east and west around the level of the earth, which divides the upper hemisphere of the world from the lower, forms a naturally level circle, which the mathematicians call the horizon. If, taking this as fixed, we draw a line from its northern edge to the point above the southern axis, and from there another rising obliquely to the celestial pole behind the stars of the Bear, we shall plainly see that the world forms a triangle, shaped like the harp the Greeks call the sambuca.

6. itaque quod est spatium proximum imo cardini ab axis linea in meridianis finibus, sub eo loco quae sunt nationes propter brevitatem altitudinis ad mundum sonitum vocis faciunt tenuem et acutissimum, uti in organo chorda quae est proxima angulo. secundum eam autem reliquae ad mediam Graeciam remissiones efficiunt in nationibus sonorum scansione, item a medio in ordinem crescendo ad extremos septentriones sub altitudines caeli nationum spiritus sonitibus gravioribus a natura rerum exprimuntur. ita videtur mundi conceptio tota propter inclinationem consonantissime per solis temperaturam ad harmoniam esse composita.

6. Accordingly, the peoples who dwell in the space nearest the lower pole, in the southern regions measured from the line of the axis, produce a thin and very

high-pitched sound of voice because of their small elevation in relation to the world, like the string nearest the angle of the instrument. Next to them, the other peoples, as far as central Greece, produce successive descents in the scale of sounds. Likewise, increasing in due order from the middle to the farthest north, beneath the heights of the sky, the breath of the peoples is uttered by nature in deeper tones. Thus the whole conception of the world, because of its inclination, appears to be composed in perfect consonance, through the tempering of the sun, according to harmony.

Thus the peoples nearest the lower pole, in the far south, speak in thin, very high voices, because they lie low in relation to the world, like the string nearest the angle of the harp. Moving northwards towards central Greece, the pitch of successive peoples descends step by step; and from the middle to the farthest north, beneath the heights of the sky, nature makes their voices deeper still. The whole frame of the world, owing to its inclination and the tempering action of the sun, appears to be composed in perfect harmony.

7. igitur quae nationes sunt inter axis meridiani cardinem ac septentrionalis medio positae, uti in diagrammate musico medianae vocis habent sonitum in sermone, quaeque progredientibus ad septentrionem sunt nationes, quod altiores habent distantias mundi, spiritus vocis habentes umore repulsos ad hypatas et proslambanomenon, a natura rerum sonitu graviore coguntur uti. eadem ratione e medio progredientibus ad meridiem gentes paranetarum <netarum> que acutissimam sonitus vocis perficiunt tenuitatem.

7. Therefore the peoples situated midway between the pole of the southern axis and that of the northern have in their speech the sound of the middle voice, as in the musical diagram; the peoples one meets advancing towards the north, because they lie at greater distances in relation to the world, have the breath of their voices driven back by moisture towards the *hypatae* and the *proslambanomenos*, and are compelled by nature to use a deeper sound; and by the same reasoning the peoples one meets advancing from the middle towards the south produce the extreme, high-pitched thinness of voice of the *paranetae* and the *netae*.

The peoples halfway between the southern and northern poles speak with the middle voice, as on the musical diagram. Those farther north, lying at greater distances in the world, have their breath forced down by moisture towards the

lowest notes, the *hypatae* and the *proslambanomenos*, and so naturally speak in deeper tones; while those who live farther south reach the very high, thin pitch of the *paranetae* and *netae*.

8. hoc autem verum esse, ex umidis naturae locis graviora fieri et ex fervidis acutiora, licet ita experiendo animadvertere. calices duo in una fornace aeque cocti aequoque pondere ad crepitumque uno sonitu sumantur. ex his unus in aquam demittatur, postea ex aqua eximatur, tunc utrique tangantur. cum enim ita factum fuerit, largiter inter eos sonitus discrepabit aequoque pondere non poterunt esse. ita et hominum corpora uno genere figurationis et una mundi coniunctione concepta alia propter regionis ardorem acutum spiritum aeris exprimunt acutum, alia propter umoris abundantiam gravissimas effundunt sonorum qualitates.

8. That this is true — that moist places by nature produce deeper sounds and hot places higher ones — may be observed by the following experiment. Take two cups fired equally in the same kiln, of equal weight and giving the same note when struck. Plunge one of them into water and then take it out; then strike both. When this has been done, the sound will differ widely between them, and they can no longer be of equal weight. In the same way the bodies of men, though conceived with one kind of form and under one conjunction of the heavens, emit in some cases a sharp breath because of the heat of the region, and in others, because of the abundance of moisture, pour out sounds of the deepest quality.

<netarum> and perfect the highest sound of the voice. And if this is true, that they become heavier in the humid places of nature and higher-pitched in warm places, we can verify it by experiments. Two cups of equal weight in a furnace are made to crackle with a single sound. One of them is lowered into the water and then taken out of the water; then both are touched. For when this is done, the sound will differ greatly between them and they will not be able to have the same weight. And so also the bodies of men, conceived by a kind of configuration and combination of the world, some, by the heat of the region, express the high-pitched spirit of the air to the touch, others, by the abundance of moisture, shed the most important qualities of sound.

9. Item propter tenuitatem caeli meridianae nationes ex acuta fervore mente expeditius celeriusque moventur ad consiliorum cogitationes. septentrionales

autem gentes infusae crassitudine caeli, propter obstantiam aeris umore refrigeratae stupentes habent mentes. hoc autem ita esse a serpentibus licet aspicere, quae per calorem cum exhaustam habent umoris refrigerationem, tunc acerrime moventur, per brumalia autem et hiberna tempora ab mutatione caeli refrigeratae, inmotae sunt stupore. ita non est mirandum, si acutiores efficit calidus aer hominum mentes, refrigeratus autem contra tardiores.

9. Moreover, owing to the thinness of the air, the southern peoples, their minds made keen by heat, are quicker and readier in devising counsel; whereas the northern peoples, steeped in a dense and humid air and their wits chilled by its resistance, are slow and dull. The like may be seen in serpents, which move most nimbly in the heat, when their moisture is drawn off, but in the cold of winter, numbed by the change of climate, lie torpid. It is no wonder, then, that warm air makes the mind keener, and cold air the duller.

Likewise, because of the thinness of the southern sky, the nations move more swiftly and rapidly to thoughts of counsel from the sharp fervour of the mind. But the northern nations, infused with the density of the air and cooled by the moisture of the air, have astonishing minds. And we may observe that this is so in the case of snakes, which, when they have exhausted the cooling effect of their moisture from the heat, then move with greater vigor, but during the winter and winter seasons, cooled by the change of climate, remain motionless in a stupor. Therefore, it is not surprising that hot air sharpens the minds of men, but cold air slows them down.

10. cum sint autem meridiane nationes animis acutissimis infinitaque sollertia consiliorum, simul ut ad fortitudinem ingrediuntur ibi succumbunt, quod habent exsuctas ab sole animorum virtutes. qui vero refrigeratis nascuntur regionibus, ad armorum vehementiam paratiores sunt magnis virtutibus sine timore, sed tarditate animi sine considerantia inruentes sine sollertia suis consiliis refragantur. cum ergo haec ita sint ab natura rerum in mundo conlocata et omnes nationes inmoderatis mixtionibus disparatae, veros inter spatium totius orbis terrarum regionesque medio mundi populus Romanus possidet fines.

10. But although the southern nations have the keenest minds and boundless ingenuity in counsel, the moment they enter upon deeds of courage they fail, for the sun has drained the vigor from their spirits; whereas those born in colder regions are readier for the clash of arms and charge without fear in their great

courage, yet, being slow of mind, they rush in without judgment and so thwart their own designs. Since nature has so ordered these things throughout the world, and all the nations differ in their unequal blendings, it is in the true mean, midway between the regions of the whole earth, that the Roman people hold their dominion.

But when the southern nations are of sharper minds and infinite ingenuity of counsel, they simultaneously gain strength, and there they succumb, because the virtues of their minds are dried by the sun; but those born in colder regions are more prepared for the violence of arms. They are of great virtue and fearless, but with slowness of mind they rush headlong without consideration and are frustrated in their plans without skill. Therefore, as these things are thus arranged by the nature of the things of the world, and all nations are disparate through immoderate mixing, the Roman people possess the boundaries between the space of the whole world and the regions at the center of the world.

11. namque temperatissimae ad utramque partem et corporum membris animorumque vigoribus pro fortitudine sunt in Italia gentes. quemadmodum enim Iovis stella inter Martis ferventissimam et Saturni frigidissimam media currens temperatur, eadem ratione Italia inter septentrionalem meridianamque ab utraque parte mixtionibus temperatas et invictas habet laudes. itaque consiliis refringit barbarorum virtutes, forti manu meridianorum cogitationes. ita divina mens civitatem populi Romani egregia temperataque regione conlocavit, uti orbis terrarum imperii potiretur.

11. For the races of Italy are the most temperate on either hand, alike in bodily frame and in strength of mind for valour. Just as the planet Jupiter, coursing between the burning heat of Mars and the icy cold of Saturn, is thereby tempered, so Italy, lying between north and south, is blended of both and holds praises unsurpassed: by counsel she breaks the courage of the barbarians, and by strength of hand the designs of the southern peoples. Thus the divine mind set the city of the Roman people in a region excellent and temperate, that it might win the empire of the whole earth.

Explanatory note — Bk. 6.1 (architecture and climate). Book VI opens domestic architecture with a theory of Hippocratic and Aristotelian root: the temperament of peoples is held to derive from climate and latitude. Vitruvius

holds that southerners, scorched by the sun, are keen of wit but scant of blood and therefore timid in battle; northerners, full of blood, are brave but slower of mind. Italy, in the temperate middle zone, is said to combine both virtues — hence the famous claim that 'the divine mind' set Rome in a temperate region that it might rule the world. The passage grounds, as if scientifically, the house oriented by climate (6.1.2): a different arrangement of rooms, courts, and openings in the north, in the south, and in the middle latitudes. The ethnographic part should be read as an ancient topos of environmental determinism, with an evident Augustan ideological function, not as geographical fact. The text has been collated with no variant affecting the sense.

Comparative note — Bk. 6.1 (climate and the character of peoples). In the Budé, Book VI is the work of Louis Callebat (2004), whose commentary interweaves the passage with Ciceronian sources and with the Greek medical (the Hippocratic Airs, Waters, Places) and Aristotelian (Politics VII) tradition. Granger (Loeb) and Rowland–Howe (Cambridge, 1999) stress the background of climatic determinism and its Augustan reworking; Corso–Romano detail the vocabulary of the humours. This edition translates in its own voice and keeps the transmitted text. The manuscript tradition (H, Harleianus 2767, and the codices collated by the Budé) offers no variant here that alters the sense: the interest of the passage is doctrinal and historical, not textual.

Editorial note. — Vitruvius's account of national character (6.1.3–11) belongs to the ancient theory of environmental determinism, descending from the Hippocratic treatise *Airs, Waters, Places* and from Aristotle's *Politics*: climate was held to shape the body, temperament, and even the pitch of a people's voice. The argument culminates, by convention, in praise of Italy's central and temperate position as fitting Rome for empire — a topos of Augustan ideology. It is read today as a document of ancient ethnographic thought rather than as natural science.

For the nations of Italy are the most temperate on both sides, and in the strength of their bodies, limbs, and minds, for strength. For just as the star Jupiter has a temperature between the hottest Mars and the coldest Saturn, so too does Italy have temperate and invincible temperatures between North and South through mixtures on both sides. And thus, with counsel, it breaks the virtues of the barbarians, with a strong hand the thoughts of the south. Thus,

the divine mind placed the city of the Roman people in an excellent and temperate country, so that it might possess the empire of the world.

12. quodsi ita est uti dissimiles regiones ab inclinationibus caeli variis generibus sint comparatae, ut etiam naturae gentium disparibus animis et corporum figuris qualitatibusque nascerentur, non dubitemus aedificiorum quoque rationes ad nationum gentiumque proprietates apte distribuere, cum habeamus ab ipsa rerum natura sollertem et expeditam monstrationem. Quoad potui summa ratione proprietates locorum ab natura rerum dispositas animadvertere exposui et quemadmodum ad solis cursum et inclinationes caeli oporteat ad gentium figuras constituere aedificiorum qualitates dixi. itaque nunc singulorum generum in aedificiis commensus symmetriarum et universos et separatos breviter explicabo.

12. But if it is so that dissimilar regions are arranged in various kinds by the inclinations of the sky, so that the natures of nations are born with dissimilar minds and shapes and qualities of bodies, let us not doubt that the proportions of buildings also are aptly distributed according to the properties of the nations, since we have a skilful and ready demonstration from the nature of things themselves. I have explained as far as I could observe the properties of places arranged by the nature of things with the greatest reason, and I have said how the qualities of buildings should be arranged according to the shapes of nations according to the course of the sun and the inclinations of the sky. Therefore I will now briefly explain the commensurate symmetries of each kind in buildings, both universal and separate.

But if it is so, that different regions are compared to different types by the inclinations of the sky, so that natural nations are also born with disparate minds and bodies with different forms and qualities, we do not hesitate to distribute the proportions of buildings also according to the properties of nations and peoples, since we have by the very nature of things a skilful and rapid demonstration.

explained to him how I was able to observe, with the greatest reason, the properties of places ordered by the nature of things, and how the course of the sun and the inclinations of the sky are necessary for the figures of nations to establish the qualities of buildings, I said; for which reason I will now explain

briefly the combination of symmetries of each type in buildings, both universal and separate.

Historical and critical note — VI.1. The connections between latitude, climate, voice, bodily constitution and national character belong to ancient medical geography and ethnography. They explain Vitruvius's architectural argument for adapting buildings to place, but are not valid biological descriptions of modern populations. Their historical logic is preserved without endorsement or retrospective scientific harmonization.

Chapter 2

1. *Nulla architecto maior cura esse debet nisi uti proportionibus ratae partis habeant aedificia rationum exactiones. cum ergo constituta symmetriarum ratio fuerit et commensus ratiocinationibus explicati, tum etiam acuminis est proprium providere ad naturam loci aut usum aut speciem < detractionibus aut> adiectionibus temperaturas ⟨et⟩ efficere, cum de symmetria sit detractum aut adiectum, uti id videatur recte esse formatum in aspectuque nihil desideretur.*

2. No architect should have greater care than that the buildings should have the exactitudes of the proportions of the approved part. Therefore, when the system of symmetries has been established and has been measured by explained reasoning, then it is also characteristic of acumen to provide for the nature of the place or the use or the appearance <and to effect tempers by deductions or> additions, when symmetry has been subtracted or added, so that it appears to be correctly formed and nothing is wanting in appearance.

There should be no further concern for the architect, unless he uses the proportions of the appraised portion to keep accurate accounts of the buildings. When, therefore, the system of symmetries has been established and the reasoning explained, it is also appropriate to provide according to the nature of the site, or the use, or the appearance, and to make additions to the temperature, when it has been subtracted or added to the symmetry, so that it appears to be correctly formed in appearance, and lacks nothing.

2. alia enim ad manum species esse videtur, alia in excelso, non eadem in concluso, dissimilis in aperto, in quibus magni iudicii est opera quid tandem sit faciundum. non enim veros videtur habere visus effectus, sed fallitur saepius iudicio ab eo mens. quemadmodum etiam in scaenis pictis videntur columnarum proiecturae, mutulorum ecphorae, signorum figurae prominentes, cum sit tabula sine dubio ad regulam plana. similiter in navibus remi cum sint sub aqua directi, tamen oculis infracti videntur, et quatenus eorum partes tangunt summam planitiem liquoris, apparent uti sunt directi, cum vero sub aqua sunt demissi, per naturae perlucidam raritatem remittunt enatantes ab suis corporibus fluentes imagines ad summam aquae planitiem atque eae ibi commotae efficere videntur infractum remorum oculis aspectum.

2. For there seems to be one kind of appearance at hand, another in a lofty place, not the same in a confined place, unlike in an open place, in which it is a matter

of great judgment what is to be done. For the sight does not seem to have true effects, but the mind is often deceived by its judgment. Just as in painted scenes the projections of columns, the eaves of the masts, the figures of signs are seen to be prominent, when the table is undoubtedly level to the rule. Similarly, in ships, when the oars are straight under water, they nevertheless appear to be broken to the eye, and insofar as their parts touch the highest level of the liquid, they appear to be straight, but when they are lowered under water, by the transparent rarity of nature, they send back floating images flowing from their bodies to the highest level of the water, and these, being moved there, seem to produce a broken appearance of the oars to the eye.

Because there seem to be different species at hand, different in height, not equal in the enclosed, unlike the open, in which there is a work of great judgment, which in the end must be done. For visible effects do not seem to have true effects, but the mind is often deceived by its judgment. In the same way, even in painted scenes, the projections of columns, pediments, and figures on cartouches are seen to stand out, since the table is undoubtedly, as a rule, flat. Similarly, on ships, the oars, when steered underwater, appear broken to the eye; and insofar as their parts touch the highest level of the liquid, they appear to be steered. However, when they are released underwater, due to the transparent strangeness of nature, they return floating images that flow from their bodies to the highest level of the water, and these, moving there, seem to produce to the eyes an appearance of broken reeds.

3. hoc autem sive simulacrorum inpulsu seu radiorum ex oculis effusionibus uti physicis placet videmus, utraque ratione videtur ita esse uti falsa iudicia oculorum habeat aspectus.

3. Now, whether we see this through the impact of images or through the effusions of rays from the eyes, as is pleasing to the physical, for both reasons it seems to be the case that the eyes have false judgments of appearance.

Now we perceive this either by the impact of images or by the effusion of rays from the eyes, according to the view that pleases the natural philosophers; and in either way it appears to be so, that the false judgments of the eyes have a semblance of truth.

4. cum ergo quae sunt vera falsa videantur et nonnulla aliter quam sunt oculis probentur, non puto oportere esse dubium quin ad locorum naturas aut

necessitates detractiones aut adiectiones fieri debeant sed ita uti nihil in his operibus desideretur. haec autem etiam ingeniorum acuminibus non solum doctrinis efficiuntur.

4. Therefore, since what is true is seen as false and is proved to the eye in some way than it is, I do not think there should be any doubt that deductions or additions should be made according to the nature or necessities of the place, so that nothing is wanting in these works. But these things are also accomplished by the acumen of genius, not only by doctrine.

Therefore, when things that are true are seen to be false, and it is proven to the eye that some things are different from what they are, I do not think there should be any doubt that deductions or additions must be made according to the nature or needs of the places, but in such a way that nothing is lacking in these works. And these things are also accomplished by the talents of genius, and not only by doctrine.

5. igitur statuenda est primum ratio symmetriarum, a qua sumatur sine dubitatione commutatio. deinde explicetur operis futuri locorum imum spatium longitudinis <et latitudinis>, cuius cum semel constituta fuerit magnitudo, sequatur eam proportionis ad decorem apparatio, uti non sit considerantibus aspectus eurythmiae dubius. de qua quibus rationibus efficiatur est mihi pronuntiandum, primumque de cavis aedium uti fieri debeant dicam.

5. First establish the system of proportions [from which any modification can confidently be derived]. Then set out the fundamental length and width of the intended building. Once its dimensions have been fixed, arrange its proportions in accordance with decor, so that its eurythmy is clear to the observer. I must explain how this is achieved, beginning with the arrangement of the courts of houses.

Therefore, it is first necessary to determine the system of symmetry from which the commutation is undoubtedly taken, then to develop the future work of the places in a space of length, whose size, once determined, will be followed by the arrangement of proportions for beauty, so that those who consider the aspects of eurythmy will have no doubts. Of which, and by what means, I shall pronounce;

Critical and architectural note — VI.2. First establish the ratio symmetriarum; only then introduce additions or reductions justified by site, use, distance,

height or perception. Symmetria, commensus, species, eurythmia and decor are related but not interchangeable. Species concerns perceived appearance here. Supplements including ⟨et detractionibus aut⟩ and ⟨et latitudinis⟩ remain marked. Optical correction is reasoned adjustment, not unrestricted compositional licence or an anticipation of every modern theory of perspective.

Chapter 3

1. *Cava aedium quinque generibus sunt distincta, quorum ita figurae nominantur, tuscanicum, corinthium, tetrastylon, displuviatum, testudinatum. tuscanica sunt in quibus trabes in atrii latitudine traiectae habeant interpensiva et collicias ab angulis parietum ad angulos tignorum intercurrentes, item asseribus stillicidiorum in medium compluvium deiectus. in corinthiis isdem rationibus trabes et compluvia conlocantur, sed a parietibus trabes recedentes in circumitionis circa columnas componuntur. tetrastyla sunt quae subiectis sub trabibus angularibus columnis et utilitatem trabibus et firmitatem praestant, quod neque ipsae magnum impetum coguntur habere neque ab interpensivis onerantur.*

2. The central courts of houses, or cava aedium, are divided into five types: Tuscan, Corinthian, tetrastyle, displuviate and testudinate. In the Tuscan type, beams spanning the width of the atrium carry the cross-members and valleys that run from the corners of the walls to the corners of the beams; the rafters direct the rain toward the central compluvium. In the Corinthian type, the beams and compluvium are arranged on the same principles, but the beams are set back from the walls and supported on columns around the opening. The tetrastyle type has columns beneath the beams at the corners, giving practical support and stability: the beams need neither span so great a distance nor bear the load of the intervening members unsupported.

Explanatory note — Bk. 6.3. Vitruvius distinguishes five forms of the central court by their roof construction. The Tuscan type spans the atrium without columns; the Corinthian uses a colonnade around the opening; the tetrastyle places four columns at its corners. The displuviate sheds water outward and, in Vitruvius's account, is vulnerable to overflowing gutters. The testudinate is fully covered and permits accommodation above it. The identification of an excavated house with one of these literary categories requires its own architectural evidence; the word testudinatum alone does not establish the material or geometry of a masonry vault.

Comparative note — Bk. 6.3. The terminology interpensiva, colliquiae, compluvium and impluvium should be compared with the technical discussions in Callebat's Budé edition of Book VI (2004), Granger's Loeb translation, Rowland and Howe (1999), and Corso and Romano (1997). This

reading edition follows the declared Krohn base. Constructional interpretation and the treatment of an individual spelling must be distinguished from a documented manuscript variant; a witness reading requires an identifiable edition, locus and siglum.

3. *Editorial note.* — The *cavaedium* (also *cavum aedium*, "the hollow of the house") is the roofed central hall of the Roman *domus*. In the Tuscan type the roof-beams span the hall and slope inward to a central opening, the *compluvium*, which sheds rain into a basin below, the *impluvium*; the tetrastyle adds four columns at the corners of that opening; the Corinthian sets more columns about it; the displuviate slopes its roofs outward; and the testudinate is wholly roofed, without an opening.

The central courts (*cavaedia*) are distinguished into five kinds, whose forms are named as follows: Tuscan, Corinthian, tetrastyle, displuviate, and testudinate.

2. displuviata autem sunt in quibus deliquiae arcam sustinentes stillicidia reiciunt. haec hibernaculis maxime praestant utilitates, quod compluvia eorum erecta non obstant luminibus tricliniorum. sed ea habent in refectionibus molestiam magnam, quod circa parietes stillicidia defluentia cum tument fistulae, quae non celeriter recipiunt ex canalibus aquam defluentem, itaque redundantes restagnant et intestinum et parietes in eis generibus aedificiorum corrumpunt. testudinata vero ibi fiunt, ubi non sunt impetus magni et in contignationibus supra spatiosae redduntur habitationes.

2. There are rain-pits in which the drops, supporting the ark, are rejected. These are of the greatest use to winter quarters, because their rain-pits, when erected, do not obstruct the lights of the dining rooms. But they are a great nuisance in the kitchens, because around the walls the dripping water is contained by pipes which do not quickly receive the water flowing from the channels, and therefore overflowing, it stagnates and corrupts the interior and walls of those types of buildings. But the vaulted ones are made where there are no great draughts and the dwellings are made spacious on the upper floors.

Displuviate (displuviata) roofs are those in which the gutters, supporting the framework, throw the rainwater outward. These prove especially advantageous for winter rooms, because their upright compluvia do not block the light of the dining rooms; but they cause great trouble in repairs,

for the gutters, retaining the water that runs down around the walls, do not let it drain off.

3. Atriorum vero latitudines ac longitudines tribus generibus formantur. et primum genus distribuitur uti longitudo cum in quinque partes divisa fuerit, tres partes latitudini dentur, alterum cum in tres partes dividatur, duae partes latitudini tribuantur, tertium uti latitudo in quadrato paribus lateribus describatur inque eo quadrato diagonios linea ducatur, et quantum spatium habuerit ea linea diagonii, tanta longitudo atrio detur.

3. The breadth and length of atria are determined by three types. The first is laid out so that, the length being divided into five parts, three are given to the breadth; the second, the length being divided into three parts, assigns two to the breadth; the third is set out by describing upon the breadth a square with equal sides, drawing a diagonal across that square, and giving the atrium a length equal to that diagonal.

But the width and length of the courts are divided into three classes. And the first class distributes, so that when the length has been divided into five parts, three parts are given to the width; the second, when it is divided into three parts, two parts are given to the width; thirdly, as in a square of equal sides the width is described, and in that square a diagonal line is drawn, and as much space as that diagonal line has, so much length is given to the court.

4. Altitudo eorum, quanta longitudo fuerit quarta dempta, sub trabes extollatur; reliquum lacunariorum et arcae supra trabes spatio tribuatur. Alis dextra ac sinistra latitudinis ⟨spatium⟩, cum sit atrii longitudo ab XXX pedibus ad pedes XL, ex tertia parte eius constituatur. ab XL ad pedes L longitudo dividatur in partes tres ⟨semis⟩, ex his una pars alis detur. cum autem erit longitudo ab quinquaginta pedibus ad sexaginta, quarta pars longitudinis alis tribuatur. a pedibus LX ad LXXX longitudo dividatur in partes quattuor et dimidiam, ex his una pars fiat alarum latitudo. a pedibus octoginta ad pedes centum in quinque partes divisa longitudo iustam constituerit latitudinem alarum. trabes earum liminares ita altae ponantur, ut altitudines latitudinibus sint aequales. imagines cum suis ornamentis ad latitudinem alarum sint constitutae.

4. Raise the atrium to the underside of the beams to a height equal to its length less one-quarter; allow the remaining space for the coffering and structure above the beams. The widths of the alae on either side should be proportioned to the

atrium's length. For a length of thirty to forty feet, give them one-third; for forty to fifty feet, divide the length into three and a half parts and give them one; for fifty to sixty feet, give them one-quarter; for sixty to eighty feet, divide it into four and a half parts and give them one; for eighty to one hundred feet, divide it into five parts to establish their width. Set their lintel beams at a height equal to the width of the alae. Arrange the ancestral images and their ornaments in proportion to that width.

5. Tablinum, si latitudo atrii erit pedum viginti, dempta tertia eius spatio, reliquum tribuatur. si erit ab pedibus XXX ad XL, ex atrii latitudine tablino dimidium tribuatur. cum autem ab XL ad LX, latitudo dividatur in partes quinque, ex his duae tablino constituantur. non enim atria minora maioribus easdem possunt habere symmetriarum rationes. si enim maiorum symmetriis utemur in minoribus, neque tablina neque alae utilitatem poterunt habere, sin autem minorum in maioribus utemur, vasta et inmania in his ea erunt membra. itaque generatim magnitudinum rationes exquisitas et utilitati et aspectui conscribendas putavi.

5. For the *tablinum*, if the breadth of the atrium is twenty feet, a third part being deducted, the remainder is assigned to it; if from thirty to forty feet, half the breadth is given to the *tablinum*; and from forty to sixty, the breadth is divided into five parts, of which two are assigned to it. For the smaller atria cannot have the same proportions as the larger.

Editorial note. — The three proportions Vitruvius gives for the atrium are 5:3, 3:2, and the ratio of a square's side to its diagonal (1:√2) — the last a geometric, irrational mean rather than a whole-number one. The tablinum isthe principal reception room opening off the atrium opposite the entrance, where the family kept its records and ancestral masks (*imagines*); the *alae* are the open recesses, or "wings," to either side.

For the tablinum, if the width of the court is twenty feet, one-third of it shall be taken away and given to the remaining space. If it is 30 to 40 feet, half the width of the court shall be given to the table. And when the width is 40 to 60 feet, it is divided into five parts, and two of these parts form a table. For smaller courts cannot have the same proportions of symmetry as larger ones. For if we use greater symmetries in smaller ones, neither the table nor the wings will

have any advantage. Then, in general, I thought to write down the reasons for the sizes, the cleanliness, the utility, and the appearance.

6. altitudo tablini ad trabem adiecta latitudinis octava constituatur. lacunaria eius tertia latitudinis ad altitudinem adiecta extollantur. fauces minoribus atriis e tablini latitudine dempta tertia, maioribus dimidia constituantur.. Latitudines ostiorum ad altitudinem si dorica erunt uti dorica, si ionica erunt uti ionica perficiantur, quemadmodum de thyromatis in quarto libro rationes symmetriarum sunt expositae. compluvii lumen latum latitudinis atrii ne minus quarta, ne plus tertia parte relinquatur, longitudo uti atrii pro rata parte fiat.

6. The height of the tabulin added to the beam is to be one-eighth of the width. Its ceilings are to be raised by one-third of the width added to the height. The openings for the smaller atriums are to be one-third deducted from the width of the tabulin, and for the larger ones, half. The images are also to be set high with their ornaments to the width of the wings. The widths of the forum to the height, if they are Doric, are to be completed as Doric, if they are Ionic, as Ionic, as the reasons for symmetry are explained in the fourth book of the Thyromata. The width of the floodlight is to be left no less than a quarter, no more than a third, the length is to be made as the proportion of the atrium.

The height of the story, including the beam, should be one-eighth of the width.

The openings of the smaller atria should be one-third the width of the table, and half the width of the larger ones. The images should also be placed high, with their decorations spanning the width.

The width of the doors to the height; if they are to be Doric, they must be finished as Doric; if they are to be Ionic, they must be finished as Ionic, as in the case of the thyromates, in which the principles of symmetry are set forth in the fourth book.

Light is admitted generously: the width of the court not less than a quarter nor more than a third; and in length it is laid out to serve as a square section of the court.

7. Peristyla autem in transverso tertia parte longiora sint quam introrsus, columnae tam altae quam porticus latae fuerint. peristyliorum intercolumnia ne minus trium, ne plus quattuor columnarum crassitudine inter se distent. sin

autem dorico more in peristylo columnae erunt faciundae, uti in quarto libro de doricis scripsi ita moduli sumantur et ad eos modulos triglyphorumque rationes disponantur.

7. Peristyles should be a third longer across than from front to back, and the columns as high as the porticoes are broad. The intercolumniations should be spaced not less than three nor more than four column-diameters apart. But if the columns of the peristyle are to be Doric, the modules are to be taken as I set down for the Doric order.

But the peristyle should be longer in the transverse third than in the interior. The columns were as tall as the porticoes were wide; the intercolumniations should be separated from each other by a thickness of no less than three and no more than four columns. But if the columns are to be made in the Doric manner in the peristyle, as I wrote in Book Four on the Doric, then the modules are taken and the modules and triglyphs are arranged for them.

8. Tricliniorum quanta latitudo fuerit, bis tanta longitudo fieri debebit. altitudines omnium conclaviorum, quae oblonga fuerint, sic habere debent rationem uti longitudinis et latitudinis mensura componatur et ex ea summa dimidium sumatur et quantum fuerit tantum altitudini detur. sin autem exhedrae aut oeci quadrati fuerint, latitudinis dimidia addita altitudines educantur. pinacothecae uti exhedrae amplis magnitudinibus sunt constituendae. oeci corinthii tetrastylique quique Aegyptii vocantur latitudinis et longitudinis uti supra tricliniorum symmetriae scriptae sunt, ita habeant rationem, sed propter columnarum interpositiones spatiosiores constituantur.

8. Dining rooms should be twice as long as they are wide. For an oblong room, add its length and width and assign half that sum to its height. Square exedras or oeci should rise to one and a half times their width. Picture galleries, like exedras, should be generously dimensioned. Corinthian, tetrastyle and so-called Egyptian halls should follow the same length-to-width proportions as dining rooms, but their overall dimensions must be greater to allow for the intervening columns.

Technical paraphrase. The rule distinguishes the plan and height of a room: a dining room has a length-to-width ratio of 2:1; an oblong room has a height equal to half the sum of its length and width; a square exedra or hall rises to 1½

times its width. The colonnaded types retain the dining-room proportion but need additional space for their columns.

9. inter corinthios autem et aegyptios hoc erit discrimen. corinthii simplices habent columnas aut in podio positas aut in imo, supraque habent epistylia et coronas aut ex intestino opere aut albario, praeterea supra coronas curva lacunaria ad circinum delumbata. in aegyptiis autem supra columnas epistylia et ab epistyliis ad parietes qui sunt circa inponenda est contignatio, supra coaxationem, pavimentum, subdiu ut sit circumitus. deinde supra epistylium ad perpendiculum inferiorum columnarum inponendae sunt minores quarta parte columnae. supra earum epistylia et ornamenta lacunariis ornantur et inter columnas superiores fenestrae conlocantur. ita basilicarum ea similitudo, non corinthiorum tricliniorum, videtur esse.

9. Between the Corinthian and the Egyptian halls (*oeci*) there will be this difference. The Corinthian have a single tier of columns, set either upon a podium or upon the ground, and above them architraves and cornices, whether of joinery or of plaster, and over the cornices a vault rounded on the compass. In the Egyptian, above the lower columns an architrave is laid, and from it to the surrounding walls a floor is set, to make an open walk in the air; then, plumb above the lower columns and set back, a second tier, a fourth smaller, is raised; above their architraves and ornaments the ceiling is coffered, and windows are set between the upper columns. Thus they have the air not so much of Corinthian dining-rooms as of basilicas.

But this will be the difference between the Corinthians and the Egyptians. The Corinthians had simple columns placed on the podium or at the bottom; and above them they would have epistyles and crowns, either of interior workmanship or of masonry; moreover, above the crowns, a curved vault, a circinum. But in the Egyptians, above the epistyles of the columns, and from the epistyles to the surrounding walls, a floor must be placed, above the floor covering, under the day, so that it is enclosed. Then, above the epistyle, on the perpendicular of the lower columns, the smallest quarter of the column will be placed. Above these are adorned the epistyles and ornaments of the ceiling, and between the upper columns are placed the windows; so it seems to be the similarity of the basilicas, and not of the Corinthian dining halls.

10. fiunt autem etiam non italicae consuetudinis oeci, quos Graeci cyzicenos appellant. hi conlocantur spectantes ad septentrionem et maxime viridia prospicientes, valvasque habent in medio ipsi autem sunt ita longi et lati uti duo triclinia cum circumitionibus inter se spectantia possint esse conlocata, habentque dextra ac sinistra lumina fenestrarum valvata, uti de lectis per spatia fenestrarum viridia prospiciantur. altitudines eorum dimidia latitudinis addita constituuntur.

10. There are also made halls (*oeci*) not in the Italian manner, which the Greeks call *Cyzicene*. These are set facing north and looking out, for choice, upon the gardens, with folding doors in the middle. They are so long and broad that two sets of dining-couches, facing one another, can be placed with room to pass around them; and they have windows opening on either hand upon the gardens, so that from the couches one may look out over the greenery.

And there are also non-Italic customs of the Oeces, whom the Greeks call Cyzicens. These are set facing north and are mostly green, and have valves in the middle. But they are so long and wide that two dining rooms can be placed opposite each other, and they have windows with shutters on the right and left, so that they can be seen from the rooftops through the green spaces of the windows. Their height is determined by adding half their width.

11. In his aedificiorum generibus omnes sunt faciendae earum symmetriarum rationes quae sine inpeditione loci fieri poterunt, luminaque parietum altitudinibus si non obscurabuntur, faciliter erunt explicata, sin autem inpedientur ab angustiis aut aliis necessitatibus, tunc erit ut ingenio et acumine de symmetriis detractiones aut adiectiones fiant, uti non dissimiles veris symmetriis perficiantur venustates.

11. In all these kinds of building the schemes of symmetry are to be carried out so far as the site allows without hindrance; and the openings for light are easily contrived, provided they are not darkened by party-walls.

Editorial note. — Vitruvius distinguishes three kinds of grand reception hall (*oeci*): the Corinthian, with a single order of columns under a vault; the Egyptian, with two tiers and a clerestory, so that it resembles a basilica; and the *Cyzicene*, a Greek type unknown to Italian practice, facing north over gardens, with wide windows and room for two facing dining-couches — an early description of a room composed around its prospect.

In this type of building, all aspects must be symmetrical, which can be done without complicating the place, and the lights, if they are not obscured by the height of the walls, will be easily explained: but if they are complicated by narrowness or other needs, then it will be so ingenious and perceptive about the symmetries that subtractions or additions are made, so as not to deviate from the true symmetries of beauty.

Critical and metrological note — VI.3. The five cava aedium—tuscanicum, corinthium, tetrastylon, displuviatum and testudinatum—are distinct technical categories. The ratios of atrium, alae, tablinum, fauces and compluvium form interdependent series. Supplements such as ⟨spatium⟩ and ⟨semis⟩ matter because they alter reconstruction. Interpensiva, colliciae, trabes, tigna and asseres are translated according to their structural and drainage functions; uncertain identifications are not concealed behind overly specific modern joinery terms.

Chapter 4

1. *Nunc explicabimus quibus proprietatibus genera aedificiorum ad usum et caeli regiones aptas debeant spectare. hiberna triclinia et balnearia ad occidentem hibernum spectent, ideo quod vespertino lumine opus est uti, praeterea quod etiam sol occidens adversus habens splendorem, calorem remittens efficit vespertino tempore regionem tepidiorem. cubicula et bybliothecae ad orientem spectare debent, usus enim matutinum postulat lumen, item in bybliothecis libri non putrescent. nam quaecumque ad meridiem et occidentem spectant, ab tineis et umore libri vitiantur, quod venti umidi advenientes procreant eas et alunt infundentesque umidos spiritus pallore volumina corrumpunt.*

2. 1. We shall now explain with what properties the several kinds of building should be suited to their use and to the quarters of the sky they face. Winter dining-rooms and baths should look towards the winter sunset, because the evening light is needed, and because the setting sun, casting its glow full upon them, gives off a warmth that makes the quarter milder towards evening. Bedrooms and libraries should face the east, for their use demands the morning light, and in libraries the books will not rot; whereas in those rooms that face south and west the books are spoiled by worms and damp, since the moist winds that rise from those quarters breed and nourish the worms and, spreading their damp breath, corrupt the rolls with mold.

Now we will explain what properties buildings should have according to their use and climatic regions. Winter dining rooms and bathrooms should face west, so as to take advantage of the afternoon light, and also because the sun, when it shines in the west, gives off heat, making the region warmer at night. Halls and libraries should face east; because morning use requires light, and in the same way, books will not rot in libraries. For all things that face south and west suffer from dampness and humidity, because the humid winds that enter bring them out into the light and nourish them, and by infusing the humid spirits, they break the volumes with pallor.

2. triclinia verna et autumnalia ad orientem. tum enim praetenta luminibus adversus solis impetus progrediens ad occidentem efficit ea temperata ad id tempus quo his solitum est uti. aestiva ad septentrionem, quod ea regio non ut reliquae per solstitium propter calorem efficiuntur aestuosae, eo quod est aversa a solis cursu semper refrigerata et salubritatem et voluptatem in usu praestat. non

minus pinacothecae et plumariorum textrina pictorumque officinae, uti colores eorum in opere propter constantiam luminis inmutata permaneant qualitate.

2. Spring and autumn dining rooms east. For with the lights shining against the sun's attacks, advancing towards the west, it creates a temperature at the time when it is customary to use them. Summer north, because that region does not become sultry like the rest during the solstice due to heat, because it is turned away from the sun's course, it is always cooled and provides health and pleasure in use. No less are the galleries and the textile workshops of the painters, so that their colors in their work remain unchanged in quality due to the constancy of the light.

Spring and autumn dining rooms should face east; for then, having advanced against the sun's attacks, having prepared them for the west, it tempers them for the season in which the work is customarily used. Summer rooms should face north, because that region, unlike the others, becomes sweltering with the heat of the solstice, but the one that is deflected by the sun's course is always cool and guarantees health and pleasure in its use. No less art galleries and textile and painters' workshops, so that their colors in the works, due to the constancy of the light, remain unaltered in quality.

Critical and environmental note — VI.4. The orientations of dining rooms, baths, bedrooms, libraries, picture galleries and workshops are prescriptions linked to sunlight, illumination and moisture. Modern bioclimatic comparison is explanatory rather than an assertion of historical identity. The discussion of books damaged by humid southern winds remains an observation about materials, not a theory of microorganisms. Wind names should be read with the system established in I.6.

Chapter 5

1. *Cum ad regiones caeli ita ea fuerint disposita, tunc etiam animadvertendum est quibus rationibus privatis aedificiis propria loca patribus familiarum et quemadmodum communia cum extraneis aedificari debeant. namque ex his quae propria sunt, in ea non est potestas omnibus intro eundi nisi invitatis, quemadmodum sunt cubicula triclinia balneae ceteraque quae easdem habent usus rationes. communia autem sunt quibus etiam invocati suo iure de populo possunt venire, id est vestibula cava aedium, peristylia quaeque eundem habere possunt usum. igitur îs qui communi sunt fortuna, non necessaria magnifica vestibula nec tabulina neque atria, quod aliis officia praestant ambiundo neque ab aliis ambiuntur.*

2. Since they have been so arranged for the regions of heaven, then it is also necessary to observe by what reasons private buildings should be built, the proper places for the fathers of families, and how common ones with strangers should be built. For of those things which are proper, there is no power for all to enter therein except those who are invited, as there are chambers, dining rooms, baths, and other things which have the same uses. But there are also common ones into which even those who are invited by their own right from the people can come, that is, vestibules, caves, peristyles, which can have the same use. Therefore, those who are in common fortune, do not need magnificent vestibules, nor small tables, nor courts, because they perform services to others by surrounding them rather than being surrounded by others.

When these principles have been established for the regions of heaven, then it must also be observed according to what principles the private buildings of the heads of families should be constructed, and how the common buildings for strangers should be constructed. For these private things are not open to everyone except guests, just as there are rooms, dining rooms, baths, and so forth, which have the same purpose. But there are common areas, to which the people may also come when they are called by right, namely, the vestibule, the courtyard, the peristyle, and these may have the same use. Therefore, those who have a common fortune do not need magnificent vestibules, tables, or courtyards, because they perform their duties in the others by moving about and are not surrounded by others.

2. qui autem fructibus rusticis serviunt, in eorum vestibulis stabula tabernae, in aedibus cryptae horrea apothecae ceteraque quae ad fructus servandos magis quam ad elegantiae decorem possunt esse, ita sunt facienda. item feneratoribus et publicanis commodiora et speciosiora et ab insidiis tuta, forensibus autem et disertis elegantiora et spatiosiora ad conventus excipiundos, nobilibus vero qui honores magistratusque gerundo praestare debent officia civibus, faciunda sunt vestibula regalia alta, atria et peristylia amplissima, silvae ambulationesque laxiores ad decorem maiestatis perfectae, praeterea bybliothecas, pinacothecas, basilicas non dissimili modo quam publicorum operum magnificentia ⟨habeant⟩ comparatas, quod in domibus eorum saepius et publica consilia et privata iudicia arbitriaque conficiuntur.

2. But those who live by the produce of the countryside should have, in their vestibules, stables and shops, and in the house itself cellars, granaries, storerooms and the like, contrived rather for keeping the produce than for elegance. For moneylenders and tax-farmers, houses more comfortable and handsome, and secure against intrigue; for advocates and men of eloquence, houses more elegant and roomy, to receive their callers; but for nobles, who in holding office and magistracies must render services to the citizens, there must be made lofty royal vestibules, the most ample atria and peristyles, with groves and broad walks finished in keeping with their dignity, and besides these, libraries and basilicas appointed with a magnificence not unlike that of public buildings — since in the houses of such men both public counsels and private suits and arbitrations are very often conducted.

But those buildings that serve the fruits of the nation, in their halls, stables, shops, cellars, granaries, warehouses, and other things, which are for preserving the fruits rather than for the beauty of elegance, should be made in this way. In the same way, for moneylenders and publicans, they are more comfortable and attractive, already safe from traps, but for judges and eloquent people, more elegant and spacious to receive their guests; but for nobles, who must fulfill the duties of citizens by exercising honors and magistracies, the royal halls should be made high, the rooms and peristyles very spacious, the groves and promenades more spacious for the beauty of perfect majesty; Moreover, libraries and basilicas are compared in a manner not unlike the magnificence of

public works, because in their houses both public policies and private judgments and sentences are often issued.

3. ergo si his rationibus ad singulorum generum personas, uti in libro primo de decore est scriptum, ita disposita erunt aedificia, non erit quod reprehendatur. habebunt enim ad omnes res commodas et emendatas explicationes. earum autem rerum non solum erunt in urbe aedificiorum rationes, sed etiam ruri, praeterquam quod in urbe atria proxima ianuis solent esse, ruri ab pseudourbanis statim peristylia, deinde tunc atria habentia circum porticus pavimentatas spectantes ad palaestras et ambulationes. Quoad potui urbanas rationes aedificiorum summatim perscribere, proposui, nunc rusticorum expeditionum ⟨apparationes⟩ ut sint ad usum commodae quibusque rationibus conlocare oporteat eas dicam.

3. Therefore, if buildings are arranged in this way for each class of persons, as is written in the first book of the Decorum, there will be nothing to be criticized for. For they will have convenient and improved explanations for all things. Now there will be the rules for buildings not only in the city, but also in the country, besides the fact that in the city the atriums are usually close to the doors, but in the country the peristyle immediately after the pseudo-urban ones, then the atriums having paved porches around the porticoes facing the palaestras and the walks. As far as I could write down the urban rules for buildings in summary, I proposed, now I will tell you the expeditions of the countrymen so that they are convenient for use and in what ways it is necessary to place them.

Therefore, if, according to these reasons, people of every class, as written in the first book on decorum, were to arrange buildings in this way, there would be nothing to criticize; for they would have suitable and better explanations for everything. And these things would not only be in the form of buildings in the city, but also in the countryside. Moreover, while in the city courtyards are usually near the gates, in the countryside they are immediately surrounded by peristyles by the pseudo-urbanites, who then arrange courts around paved galleries in front of gymnasiums and promenades.

In order to summarize the urban aspects of the buildings, I proposed; Now I will speak of the expeditions to the countries, what may be of convenient use and by what means it is necessary to arrange them.

Critical and social note — VI.5. Propria and communia organize the house by access and the owner's position. Farmers, moneylenders, tax contractors, advocates, magistrates and nobles occupy a historically Roman social framework. Decor retains its technical sense of appropriateness rather than merely 'decoration'. The prescription is neither a universal description of Roman housing nor a social norm asserted for other periods.

Chapter 6

1. *primum de salubritatibus, uti in primo volumine de moenibus conlocandis scriptum est, regiones aspiciantur et ita villae conlocentur. magnitudines earum ad modum agri copiasque fructuum comparentur. chortes magnitudinesque earum ad pecorum numerum atque quot iuga boum opus fuerit ibi versari, ita finiantur. in chorte culina quam calidissimo loco designetur, coniuncta autem habeat bubilia, quorum praesepia ad focum et orientis caeli regionem spectent, ideo quod boves lumen et ignem spectando horridi non fiunt. item agricolae religione inpediti non putant oportere aliam regionem caeli boves spectare nisi ortum solis.*

2. First of all, concerning health, as is written in the first volume on the placing of walls, let the regions be considered and the villages placed accordingly. Their sizes should be compared to the size of the field and the abundance of fruits. The cohorts and their sizes should be determined according to the number of cattle and how many yokes of oxen it will be necessary to turn there. In the cohort, the kitchen should be designated in the warmest place, and the cattle should be connected, the stalls of which should look at the hearth and the eastern sky, so that the oxen do not become horrified by looking at light and fire. Likewise, farmers who are inexperienced in the regions do not think that it is necessary for the oxen to look at any other sky region than the rising of the sun.

First, as written in the first volume on the placement of walls, one must consider the regions and thus lay out the cities. Their sizes are compared to the size of the land and the abundance of crops. In this way, the herds and their size must be limited according to the number of cattle and the number of oxen that must be kept there. In the kitchen, the warmest place must be designated. And let the livestock be gathered together, their stalls facing the fire and the eastern sky, so that the oxen do not become frightened by the light and the fire. Likewise, farmers in uninformed regions do not believe it necessary for livestock to face any other region of the sky except the sunrise.

2. bubilium autem debent esse latitudines nec minores pedum denûm nec maiores quindenûm, longitudo uti singula iuga ne minus pedes occupent septenos. balnearia item coniuncta sint culinae, ita enim lavationi rusticae ministratio non erit longe. torcular item proximum sit culinae, ita enim ad molarios fructus commoda erit ministratio, habeatque coniunctam vinariam cellam habentem ab

septentrione lumina fenestrarum. cum enim alia parte habuerit qua sol calfacere possit, vinum quod erit in ea cella confusum ab calore efficietur inbecillum.

2. The widths of the cattle pens should be neither less than ten feet nor more than fifteen, and the length should be such that each row does not occupy less than seven feet. The baths should also be connected to the kitchen, for thus the service of the country will not be far. The winepress should also be close to the kitchen, for thus the service of the olive trees will be convenient, and it should have a wine cellar connected to it, having windows facing north. For since it has another side from which the sun can warm it, the wine that will be in that cellar will be confused by the heat and become weak.

The cattle-stalls (bubilia) should be not less than ten feet wide nor more than fifteen, and of such length that each yoke of oxen occupies no less than seven feet.

3. olearia autem ita est conlocanda ut habeat a meridie calidisque regionibus lumen. non enim debet oleum congelari sed tepore caloris extenuari. magnitudines autem earum ad fructuum rationem et numerum doliorum sunt faciundae, quae cum sint cullearia, per medium occupare debent pedes quaternos. ipsum autem torcular si non cocleis•torquetur sed vectibus et prelo premitur, ne minus longum pedes XL constituatur, ita enim erit vectiario spatium expeditum. latitudo eius ne minus pedum senûm denûm, nam sic erit ad prelum opus facientibus libera versatio et expedita. sin autem duobus prelis loco opus fuerit, quattuor et viginti pedes latitudini dentur.

3. The oil press should be placed so that it has light from the south and hot regions. For the oil should not be frozen but rather be weakened by the warmth of the heat. Their sizes should be made according to the quantity of fruit and the number of barrels, which, since they are spoon-shaped, should occupy four feet in the middle. But if the press itself is not turned with screws but is pressed with bars and a press, it should not be less than forty feet long, for in this way there will be an easy space for the transporter. Its width should not be less than ten feet, for in this way those doing the full work will have free and easy movement. But if two presses are needed instead, twenty-four feet should be given to the width.

The oil-room (olearium) should be so placed as to receive light from the south and from the warm quarters, for the oil ought not to congeal but to be kept fluid by a gentle warmth.

4. Ovilia et caprilia ita sunt magna facienda uti singula pecora areae ne minus pedes quaternos et semipedem, ne plus senos possint habere. granaria sublimata et ad septentrionem aut aquilonem spectantia disponantur, ita enim frumenta non poterint cito concalescere, sed ab flatu refrigerata diu servantur. namque ceterae regiones procreant curculionem et reliquas bestiolas quae frumentis solent nocere. equilibus quae maxime in villa loca calidissima fuerint constituantur, dum ne ad focum spectent. cum enim iumenta proxime ignem stabulantur, horrida fiunt.

4. Oval and goat pens should be made so large that each herd of cattle cannot have less than four and a half feet, or more than six. Granaries should be elevated and arranged facing north or northeast, for in this way the grain will not be able to heat up quickly, but will be kept cool by the wind for a long time. For other regions breed weevils and other small animals that are accustomed to harm grain. For horses, the warmest places in the village should be placed, so that they do not look at the fire. For when cattle are stabled close to the fire, they become horrified.

The sheepfolds and goat-pens (ovilia et caprilia) should be made large enough that each animal has not less than four and a half feet of room, nor more than six.

5. item non sunt inutilia praesepia quae conlocantur extra culinam in aperto contra orientem. cum enim in hieme anni sereno caelo in ea traducuntur matutino boves, ad solem pabulum capientes fiunt nitidiores. horrea fenilia farraria pistrina extra villam facienda videntur, ut ab ignis periculo sint villae tutiores. si quid delicatius in villis faciundum fuerit, ex symmetriis quae in urbanis supra scriptis sunt constitutae ita struantur uti sine inpeditione rusticae utilitatis aedificentur.

5. Likewise, stables placed outside the kitchen in the open air facing east are not useless. For when in the winter of the year the oxen are brought there in the morning in a clear sky, they become brighter as they feed in the sun. Barns, barns, mills, and bakeries seem to be built outside the village, so that the villages are safer from the danger of fire. If anything more delicate is to be done in the villages, they should be constructed in such a way that they are built without

hindering the rural utility, based on the symmetries established in urban buildings above.

Mangers (praesepia) set outside the kitchen, in the open and facing east, are likewise not without use; for when, on a clear winter's morning, the oxen are led out to them, they feed in the sun and grow sleeker than in a closed stall.

6. Omniaque aedificia ut luminosa sint, oportet curari; sed quae sunt ad villas, faciliora videntur esse, ideo quod paries nullius vicini potest obstare, in urbe autem aut communium parietum altitudines aut angustiae loci inpediundo faciunt obscuritates. Itaque de ea re sic erit experiundum. Ex qua parte lumen oporteat sumere, linea tendatur ab altitudine parietis, qui videtur obstare, ad eum locum, quo oporteat inmittere, et si ab ea linea, in altitudinem cum prospiciatur, poterit spatium puri caeli amplum videri, in eo loco lumen erit sine inpeditione.

6. All buildings must be cared for so that they are luminous, but those that are near villages seem to be easier because no neighbor's wall can obstruct them, but in a city either the heights of the common walls or the narrowness of the place obstruct them and cause darkness. Therefore, this is what we should try about this matter. From which side the light should be let in, and if from that line, when looking up into the sky, a large space of pure sky can be seen, in that place there will be light without obstruction.

6. Care should be taken to make every building well lit. This is easier in villas, where no neighbor's wall can obstruct the light; in cities, high party walls and narrow sites cause darkness. Test the situation as follows. On the side from which light is required, stretch a line from the top of the obstructing wall to the intended opening. If, looking upward from that line, a broad expanse of clear sky is visible, light will enter that position without obstruction.

It is necessary to ensure that all buildings are well-lit; but those in the countryside seem easier to achieve, because no neighboring wall can obstruct them. In the city, however, either the height of the surrounding walls or the narrowness of the space makes darkness more difficult. And this will be proven in this way: From which side the light should be taken, draw a line from the height of the wall that seems to obstruct it to the place where it should be allowed to enter. If, from that line, you look upwards towards the higher point,

you will see a large expanse of clear sky; in that place there will be unobstructed light.

7. sin autem officient trabes ea lumina aut contignationes, de superioribus partibus aperiatur et ita inmittatur. et ad summam ita est gubernandum ut ex quibuscumque partibus caelum prospici poterit, per eas fenestrarum loca relinquantur, sic enim lucida erunt aedificia. cum autem in tricliniis ceterisque conclavibus maximus est usus luminum, tum etiam in itineribus clivis scalis, quod in his saepius alii aliis obviam venientes ferentes sarcinas solent incurrere. Quoad potui distributiones operum nostratium, ut sint aedificatoribus non obscurae, explicui. nunc etiam quemadmodum Graecorum consuetudinibus aedificia distribuantur, uti non sint ignota, summatim exponam.

7. But if the beams or lintels of the floors obstruct it, it should be opened from the upper parts and let in. And to sum up, it should be so governed that from whatever parts the sky can be seen, places for windows should be left through them, for in this way the buildings will be bright. But since in dining rooms and other rooms the greatest use is made of lights, then also in the paths of stairs, because in these people often encounter each other carrying loads. As far as I could, I have explained the distributions of our works, so that they may not be obscure to the builders. Now I will also briefly explain how buildings are distributed according to the customs of the Greeks, so that they may not be unknown.

But if beams, lintels, or floor-joists should obstruct the light, an opening should be made in the upper part and the light admitted from there. In sum, the rule is to leave light free on whatever side the sky is open.

As far as I could, I explained the layouts of our works so that they would not be obscure to the builders; now also, so that they may not be unknown, I will briefly explain how the buildings are laid out according to the customs of the Greeks.

Editorial note. — Chapter 6 turns from the town house to the villa rustica, the working farmstead, whose parts Vitruvius orders by practical function rather than display: the cattle-stalls (bubilia) near the kitchen fire and facing east; the oil-room (olearium) set to the warm south, lest the oil congeal; the sheepfolds, goat-pens and granaries (horrea) sized to their stock and produce. The same reasoning governs Roman agronomy in Cato (De agri cultura), Varro (Res

rusticae) and, later, Columella, with whose prescriptions Vitruvius's broadly agree; the governing principle throughout is salubritas — a healthy site, good light and proper orientation (cf. 1.4 and 6.4).

Critical and agricultural note — VI.6. The villa is dimensioned in relation to land, produce, livestock and productive processes. Kitchens, stalls, presses, wine and oil cellars, granaries and feed spaces form an integrated functional system. Bubilia, torcular, cella olearia, dolia, granaria and praesepia require controlled readings because they affect reconstruction. Ancient quantities and dimensions remain explicit before modern conversion; smoke, heat and storage are explained within the technical knowledge of the passage.

Chapter 7

1. *Atriis Graeci quia non utuntur, neque aedificant, sed ab ianua introeuntibus itinera faciunt latitudinibus non spatiosis, et ex una parte equilia, ex altera ostiariis cellas, statimque ianuae interiores finiuntur. hic autem locus inter duas ianuas graece θυρωρεῖον appellatur. deinde est introitus in peristylon. id peristylum in tribus partibus habet porticus inque parte quae spectat ad meridiem duas antas inter se spatio amplo distantes in quibus trabes invehuntur, et quantum inter antas distat, ex eo tertia dempta spatium datur introrsus. hic locus apud non nullos prostas, apud alios pastas nominatur.*

2. The Greeks do not use or build courts, but they make paths that are not very wide for those entering from the door, and on one side they have stalls, on the other the cells for the porters, and immediately the inner doors end. This place between the two doors is called in Greek θυρωρεῖον. Then there is the entrance into the peristyle. This peristyle has a portico on three sides, and on the side that faces south there are two antae, widely spaced apart from each other, upon which beams are carried, and the distance between the arches is taken from that, one third of the space is given inside. This place is called prostas by some, pastas by others.

Because the Greeks neither use nor build atriums, but rather, from the entrance gates, they make narrow passageways, with stables on one side and porticoes on the other, and immediately afterward, the inner gates. Now, this place between the two gates is called the thyroron in Greek. Then there is the entrance to the peristyle. This peristyle has a portico on three sides, and on the south-facing side, two antae set widely apart, upon which the beams are carried. As for the distance between the stories, a third space is taken to provide room for the interior. This place is called the prostas by some, and the pastas by others.

2. in his locis introrsus constituuntur oeci magni, in quibus matres familiarum cum lanificis habent sessionem. in prostadis autem dextra ac sinistra cubicula sunt conlocata, quorum unum thalamos, alterum amphithalamos dicitur. circum autem in porticibus triclinia cotidiana, cubicula, etiam cellae familiaricae constituuntur. haec pars aedificii gynaeconitis appellatur.

2. Within these are set the great halls (*oeci*) where the mistresses of the household sit with the wool-workers. To right and left of the *prostas* are bedchambers, the one called the *thalamos*, the other the *amphithalamos*. Around the porticoes are

the everyday dining-rooms, bedchambers, and servants' rooms. This part of the house is called the *gynaeconitis*, the women's quarters.

Editorial note. — The Greek house, as Vitruvius describes it, is divided into two quarters: the *gynaeconitis* (women's apartments, set about the first peristyle, where the mistress sat with her wool-workers) and the *andronitis* (men's apartments, about a second and grander peristyle, where the men dined and received guests). The arrangement reflects the seclusion of women in classical Greek domestic life, in contrast to the more open Roman *atrium* house.

Within these places large oeci are installed, in which the matrons gather with the wool-spinners. On the right and left of the prostas there are rooms, one of which is called the thalamus and the other the amphithalamus. And around, in the porticoes, are set the everyday dining rooms, the bedchambers, and even the servants' quarters. This part of the building is called the gynaeconitis.

3. Coniunguntur autem his domus ampliores habentes lautiora peristylia, in quibus pares sunt quattuor porticus altitudinibus, aut una quae ad meridiem spectat excelsioribus columnis constituitur. id autem peristylum quod unam altiorem habet porticum, rhodiacum dicitur. habent autem eae domus vestibula egregia et ianuas proprias cum dignitate porticusque peristyliorum albariis et tectoriis et ex intestino opere lacunariis ornatas, et in porticibus quae ad septentrionem spectant triclinia cyzicena et pinacothecas, ad orientem autem bybliothecas, exhedras ad occidentem, ad meridiem vero spectantes oecos quadratos ita ampla magnitudine uti faciliter in eo quattuor tricliniis stratis ministrationum ludorumque operis locus possit esse spatiosus.

3. These houses are joined by larger ones, having more elaborate peristyles, in which there are four porticos of equal height, or one that faces south is built with higher columns. But that peristyle which has one higher portico is called Rhodian. These houses have excellent vestibules and doors of their own, and the porticos of the peristyles are adorned with dignity, with white walls and ceilings and with ceilings of internal work, and in the porticos that face north there are dining rooms and picture galleries, while to the east there are libraries, and to the west there are rooms facing south, and square courtyards of ample size, so that in those four dining rooms there can be easily a spacious place for serving meals and playing.

Explanatory note — Bk. 6.7 (the Greek house). Vitruvius describes the Greek house by contrast with the Roman: the Greeks use no atrium. From the gate a passage —the thyroreion (θυρωρεῖον), between the two doors, with the stable on one side and the porter's rooms on the other— leads to the peristyle, porticoed on three sides; on the south side two antae carry beams and form a recess called prostas (προστάς) or parastas. Within lies the great oecus where the mistress sits with the wool-spinners, flanked by the thalamus and the amphithalamus; around the porticoes are triclinia, bedchambers, and servants' quarters: this is the gynaeconitis (γυναικωνῖτις), the women's area. Adjoining it is a larger house with a more spacious peristyle (four equal porticoes, or the southern one higher —the 'Rhodian peristyle'—), with cyzicene oeci, triclinia, and picture-galleries: the andronitis (ἀνδρωνῖτις), reserved for men, since women did not recline at table. Between the two peristyles run the mesaulae, which the Romans call androne s. The text has been collated with no variant affecting the sense.

Comparative note — Bk. 6.7 (Greek house). In the Budé, Louis Callebat (2004) treats this chapter as a key witness to the Greco-Latin domestic vocabulary and discusses the terminological mismatches Vitruvius himself flags (androne s, xystus, prothyrum/diathyron). Granger (Loeb) and Rowland–Howe (Cambridge, 1999) recall that the Vitruvian account served as the basis for reconstructions of the Greek house before excavation, and that the finds at Delos, Priene, and Olynthus show plans more open and less rigid in the separation of the sexes than the text implies (as recent studies of the gynaeconitis and the androne , e.g. by S. Weir and H. Franks, have qualified). This edition translates in its own voice and keeps the Greek spelling of the technical terms; the gynaeconitis/andronitis division is presented as a Vitruvian category, not as secure archaeological fact.

And to these are added larger houses that have more elaborate peristyles, in which there are four porticoes of equal height, or one facing south formed by taller columns. Now that peristyle, which has a taller portico, is called a Rhodo. And those houses have excellent vestibules and their own doors, with dignified porticoes and peristyles, decorated with wainscoting and roofing, and interior ceilings; large shutters with square doors, so that it can easily be spacious with four dining rooms, bedrooms, servants' quarters, and a workshop.

4. in his oecis fiunt virilia convivia. non enim fuerat institutum matres familiarum eorum moribus accumbere. haec autem peristylia domus andronitides dicuntur, quod in his viri sine interpellationibus mulierum versantur. praeterea dextra ac sinistra domunculae constituuntur habentes proprias ianuas triclinia et cubicula commoda, uti hospites advenientes non in peristylia sed in ea hospitalia recipiantur. nam cum fuerunt Graeci delicatiores et fortuna opulentiores, hospitibus advenientibus instruebant triclinia cubicula cum penu cellas primoque die ad cenam invitabant, postero mittebant pullos ova holera poma reliquasque res agrestes. ideo pictores ea quae mittebantur hospitibus picturis imitantes xenia appellaverunt. ita patres familiarum in hospitio non videbantur esse peregre, habentes secretam in his hospitalibus libertatem.

4. In these rooms, men's banquets are held. For it was not customary for mothers of families to sit down in their manners. But this peristyle of the house is called the Andronitides, because in it the men are occupied without the interruptions of women. Moreover, on the right and left are small houses built, having their own doors, dining rooms and comfortable bedrooms, so that guests arriving may not be received in the peristyle but in that hospital. For when the Greeks were more refined and more wealthy in fortune, they furnished dining rooms, bedrooms with pantry rooms for guests arriving, and on the first day they invited them to dinner, and on the second day they sent them chickens, eggs, vegetables, apples, and other country things. Therefore, painters, imitating the things that were sent to the guests in their paintings, called them xenia. Thus the fathers of families did not seem to be abroad in their hospitality, having a secret liberality in these hospitals.

In these places, men's parties are held, because it was not the custom of the mother's family to conform to her manners. These peristyle houses are called andronites, because men occupy them without interruption from women. Moreover, to the right and left are arranged small houses with their own doors, dining rooms, and comfortable bedrooms, so that arriving guests are received not in the peristyle, but in these smaller, more intimate spaces. For when the Greeks were more refined and wealthier, they furnished dining rooms, bedrooms, and even rooms with courtyards for their guests, and on the first day they invited them to dinner, and the next day they sent them chickens, eggs, vegetables, apples, and other local produce. That is why painters, imitating

paintings, called the things they sent to their guests "paintings." Thus, parents in the hospital were not seen as foreigners, and there was a secret liberality in these hospitals.

5. inter duo autem peristylia et hospitalia itinera sunt quae mesauloe dicuntur, quod inter duas aulas media sunt interposita, nostri autem eas andronas appellant. Sed hoc valde est mirandum, nec enim graece nec latine potest id convenire. Graeci enim ἀνδρῶνας appellant oecus, ubi convivia virilia solent esse, quod eo mulieres non accedunt. item aliae res sunt similes, uti xystus prothyrum telamones et nonnulla alia eius modi.ξυστός enim est graeca appellatione porticus ampla latitudine, in qua athletae per hiberna tempora exercentur. nostri autem hypaethrus ambulationes xysta appellant, quas Graeci παραδρομίδας dicunt. item πρόθυρα graece dicuntur quae sunt ante ianuas vestibula, nos autem appellamus prothyra quae graece dicuntur διάθυρα.

5. Between the two peristyles and the guest apartments are passages called *mesaulae*, because they lie between two courts; our own people, however, call them *androne*s. Yet this is very strange, for the term agrees with neither Greek nor Latin usage: the Greeks call *ἀνδρῶνας* the halls where the men's banquets are held, since women do not enter there. There are other terms of the same kind — *xystus*, *prothyrum*, *telamones*, and a few besides. The *ξύστος*, in Greek usage, is a portico of ample breadth in which athletes train during the winter season; our people, however, call open-air walks *xysta*, which the Greeks name *παραδρομίδας*. Likewise, what in Greek are called *πρόθυρα* are the vestibules before the doors; but we call *prothyra* what the Greeks call *διάθυρα*.

Now, between the two peristyles and the hospitals there are passages, which are called mesaulos, because they are interposed between the two rooms; but our people call them corridors.

But this is very surprising, because neither Greek nor Latin can agree on it. For the Greeks call the halls where men's banquets are normally held oecus, because women do not go there. Likewise, there are other similar things, such as terraces, protirum, telamones, and other similar things. For xystos is a Greek name for a wide gallery where athletes train during the winter seasons; but our own people call open-air walks xysta, which the Greeks call paradromidas. Moreover, in Greek they are called prothyra, which are in front

of the entrance gates, but we call them prothyra, which in Greek are called diathyra.

6. item si qua virili figura signa mutulos aut coronas sustinent, nostri telamones appellant, cuius rationes quid ita aut quare dicantur ex historiis non inveniuntur, Graeci vero eos ἄτλαντας vocitant. Atlas enim formatur historia sustinens mundum, ideo quod is primum cursum solis et lunae siderumque omnium versationum rationes vigore animi sollertiaque curavit hominibus tradenda, eaque re a pictoribus et statuariis deformatur pro eo beneficio sustinens mundum, filiaeque eius Atlantides, quas nos vergilias, Graeci autem πλειάδας nominant, cum sideribus in mundo sunt dedicatae.

6. Likewise, if there are those who support the symbols of a man's figure with a mute or crown, ours call them Telamones, the reasons for which are not found in the histories, but the Greeks call them Atlases. For Atlas is formed by history as supporting the world, because he was the first to take care of the course of the sun and moon and the reasons for all the movements of the stars, by the vigor of his mind and skill, to be handed down to men, and for that reason he is deformed by painters and sculptors as supporting the world for his benefit, and his daughters, the Atlanteans, whom we call Vergilias, and the Greeks call Pleiades, are dedicated to the stars in the world.

Likewise, if any male figure bears signs of mutes or crowns, our people call them telamons; the reasons why, or why they are called so, are not found in the histories, but the Greeks call them Atlantes. For Atlas is formed by history, who sustains the world, for the reason that he first concerned himself with transmitting to men the course of the sun and the moon, and all the directions of the stars, with the vigor of his mind and his ingenuity; a name, with the stars of the world to which they are dedicated.

7. nec tamen ego ut mutetur consuetudo nominationum aut sermonis, ideo haec proposui, sed uti non sint ignota philologis exponenda iudicavi. Quibus consuetudinibus aedificia italico more et Graecorum institutis conformantur exposui, et de symmetriis singulorum generum proportiones perscripsi. ergo quoniam de venustate decoreque ante est conscriptum, nunc exponemus de firmitate quemadmodum ea sine vitiis permanentia ad vetustatem conlocentur.

7. I have not set out these matters to alter established names or ordinary usage, but to make them known to those concerned with language. I have

explained the customs according to which buildings are formed in the Italian manner and in the Greek tradition, and have described the proportions of each type. Having discussed beauty and propriety, I shall now turn to strength and explain how buildings can be constructed without defects for lasting service.

Nevertheless, I did not wish the customary names or the usage of speech to be altered; for this reason I have set these terms down, but, so that they should not be unknown to scholars, I have judged it well to explain them.

Technical paraphrase of 6.7.7. The preceding account distinguishes Italian practice from Greek domestic arrangements and gives the proportions appropriate to each. Vitruvius now turns from appearance and propriety to the constructional conditions of durability.

Critical and terminological note — VI.7. Vitruvius describes Greek domestic arrangements through Latin equivalents which he acknowledges to be imperfect. Θυρωρεῖον, προστάς, θάλαμος, ἀμφιθάλαμος, γυναικωνῖτις, ἀνδρῶνες and ξένια therefore retain their technical identities. The difficulty of mesaulae/androne is part of the testimony. It should be recorded rather than dissolved by a single convenient English equivalent or a supposedly universal reconstruction of the Greek house.

Chapter 8

1. *Aedificia quae plano pede instituuntur, si fundamenta eorum facta fuerint ita ut in prioribus libris de muro et theatris a nobis est expositum, ad vetustatem ea erunt sine dubitatione firma. sin autem hypogea concamarationesque instituentur, fundationes eorum fieri debent crassiores quam quae in superioribus aedificiis structurae sunt futurae, eorumque parietes pilae columnae ad perpendiculum inferiorum medio conlocentur, uti solido respondeant. nam si in pendentibus onera fuerint parietum aut columnarum, non poterint habere perpetuam firmitatem.*

2. Buildings that are built on a flat base, if their foundations are made in such a way as we have explained in previous books on walls and theaters, will undoubtedly be strong for a long time. But if basements and chambers are built, their foundations should be made thicker than those that will be used in the structures of the upper buildings, and their walls, pillars, and columns should be placed perpendicular to the middle of the lower ones, so that they correspond to the solid. For if the loads of the walls or columns are on the overhangs, they will not be able to have permanent strength.

Buildings erected on a level foundation, if their foundations have been made in the manner explained in previous books concerning walls and theaters, will undoubtedly remain firm for a long time. But if cellars and vaults are to be built, their foundations must be thicker than those of the future structures of the buildings above. And their walls, spheres, and columns should be placed perpendicular to those below, so that they correspond to a solid structure; for if the loads of the walls or columns were suspended, they could not have perpetual firmness.

2. praeterea inter lumina secundum pilas et antas postes si supponentur, erunt non vitiosae. limina enim et trabes structuris cum sint oneratae, medio spatio pandantes frangunt sub lysi structuras. cum autem subiecti fuerint et subcuneati postes, non patiuntur insidere trabes neque eas laedere.

Furthermore, if placed between the openings, by piers and antae, they will not be defective. For thresholds and beams, when loaded with structures, break the suspended structures while they hang in half; but when the posts have been secured and wedged together, they do not allow the beams to rest on them or damage them.

3. item administrandum est uti levent onus parietum fornicationes cuneorum divisionibus et ad centrum respondentes earum conclusurae. cum enim extra trabes aut liminum capita arcus cuneis erunt conclusae, primum non pandabit materies levata onere, deinde si quod vetustate vitium ceperit, sine molitione fulturarum faciliter mutabitur.

3. It is also necessary to ensure that the load on the walls is relieved by the divisions of the wedges and their closures corresponding to the center. For when the outside beams or the capitals of the thresholds are closed with wedges, first the materials will not expand when the load is lifted, and then if they have developed any defect due to age, they can be easily replaced without the need for supports.

It should also be managed in such a way as to lighten the load of the walls by the arching of vaults by dividing the wedges and their corresponding center closures. Because when the ends of the beams or thresholds of the arch have been secured with wedges, the materials will not be placed under the lifted load first; then, if something has acquired a defect with age, it will be easily replaced without the effort of supports.

4. itemque quae pilatim aguntur aedificia, et cuneorum divisionibus coagmentis ad centrum respondentibus fornices concluduntur, extremae pilae in his latiores spatio sunt faciundae, uti vires eae habentes resistere possint, cum cunei ab oneribus parietum pressi per coagmenta ad centrum se prementes extruderent incumbas. itaque si angulares pilae erunt spatiosis magnitudinibus, continendo cuneos firmitatem operibus praestabunt.

4. Likewise, buildings carried up in piers, when the arches are closed by the divisions of the wedges corresponding to the joints at the center, the outer piers in these should be made wider in space, so that the forces they possess can resist, when the wedges, pressed by the loads of the walls, press themselves through the joints towards the center and extrude themselves. Therefore, if the corner piles are of spacious sizes, by containing the wedges they will provide stability to the works.

Similarly, buildings constructed in piers, whose arches are closed by means of wedge divisions corresponding to the center. In these divisions, the end piers must be widened so that they can withstand the force exerted on the wedges when they are pressed by the wall loads and pushed outwards, pressing

towards the center. Therefore, if the angular piers are of large size, by containing the wedges they will guarantee the stability of the structures.

5. Cum in his rebus animadversum fuerit uti ea diligentia in his adhibeatur, non minus etiam observandum est uti omnes structurae perpendiculo respondeant neque habeant in ulla parte proclinationes. maxima autem esse debet cura substructionum, quod in his infinita vitia solet facere terrae congestio. ea enim non potest esse semper uno pondere quo solet esse per aestatem, sed hibernis temporibus recipiendo ex imbribus aquae multitudinem crescens et pondere et amplitudine disrumpit et extrudit structurarum saeptiones.

5. Since in these matters it has been observed that such diligence is applied, it is no less important to observe that all structures correspond to the perpendicular and have no inclinations in any part. The greatest care should be taken with the substructures, because in these the accumulation of earth tends to cause infinite defects. For it cannot always be with the same weight as it usually is during the summer, but in winter times, receiving a multitude of water from the rains, it increases in weight and size and bursts and pushes out the partitions of the structures.

Since it has been observed that the same care must be taken in these matters, it is no less necessary to ensure that all structures are perpendicular and have no inclination whatsoever. However, great care must be taken with the substructures, because in them, soil compaction often causes numerous defects. This is because the soil is not always uniform in weight, as it usually is during the summer, but rather, during the winter months, it absorbs an ever-increasing amount of water from the rains, and this weight and size can cause the structures to break and extrude.

6. itaque ut huic vitio medeatur. sic erit faciundum ut primum pro amplitudine congestionis crassitudo structurae constituatur, deinde in frontibus anterides, sive erismae sunt, una struantur, eaeque inter se distent tanto spatio quanta altitudo substructionis est futura, crassitudine eadem qua substructio. procurrat autem ab imo pro quam crassitudo constituta fuerit substructionis, deinde contrahatur gradatim ita uti summam habeat prominentiam quanta operis est crassitudo.

6. Therefore, to remedy this defect, the thickness of the structure should first be fixed in proportion to the mass of earth to be retained; then, on the face,

buttresses (anterides, or in Greek erismae) are built, set apart from one another by as much space as the height of the substructure will be, and of the same thickness as the substructure itself. They are carried out from the bottom by as much as the thickness fixed for the structure, and then drawn in so that the part standing in the face is as thick as a fourth part of the height.

Explanatory note — Bk. 6.8 (foundations and retaining walls). The chapter treats substructiones: foundations carried down to solid ground and, above all, retaining walls able to resist the thrust of the earth. Vitruvius prescribes thickening the wall in proportion to the mass retained and, on its outer face, raising with it counterforts —the anterides, which the Greeks call erismae (ἐρείσματα)— spaced at intervals equal to the wall's height, projecting at the base and tapering upward. On the earth side he adds saw-tooth projections and diagonal walls at the corners, so that the thrust does not bear on the wall as a single mass but is distributed: the same principle as the 'comb-like' rampart of 1.5.7. It is one of the few passages of ancient soil statics, today corroborated by the structural analysis of Roman theater substructures (Augst, Avenches). The text has been collated with no variant affecting the sense.

Comparative note — Bk. 6.8 (counterforts, anterides sive erismae). In the Budé, Book VI is the work of Louis Callebat (2004), who comments on the passage with the engineering of terraces and substructures. Granger (Loeb) and Rowland–Howe (Cambridge, 1999) —whose plate labels it 'Retaining Walls and Buttresses (Anterides sive Erismae)'— stress Vitruvius's anticipation of the counterfort and of the distribution of thrust; Corso–Romano fix the vocabulary (anterides, erismae, congestio). This edition keeps the transmitted text and translates in its own voice; H and the codices collated by the Budé offer no variant here that alters the sense.

Therefore, to remedy this defect, it will be necessary to first determine the thickness of the structure in proportion to the mass of earth to be retained. Then, on the face, the buttresses (in Greek erismae) are built, set apart from one another by as much as the height of the future substructure, with the same thickness as the substructure; and it runs from below, for which the thickness of the substructure has been determined, then it gradually contracts, so that it has the greatest prominence, as much as the thickness of the work.

7. praeterea introrsus contra terrenum coniuncta muro serratim struantur, uti singuli dentes ab muro tantum distent quanta altitudo futura erit substructionis, crassitudines autem habeant dentium structurae uti muri. item in extremis angulis cum recessum fuerit ab interiore angulo spatio altitudinis substructionis, in utramque partem signetur et ab his signis diagonios structura conlocetur, et ab ea media altera coniuncta cum angulo muri. ita dentes et diagonioe structurae non patientur tota vi premere murum, sed dissipabunt retinendo impetum congestionis.

7. Furthermore, they are built inwards against the ground, connected to the wall, in a serrated manner, so that each tooth is as far from the wall as the future height of the substructure will be, and the thickness of the teeth should be as thick as the structure of the wall. Likewise, in the extreme corners, when there is a recess from the inner corner by the space of the height of the substructure, let diagonals be marked on both sides and from these marks the structure is placed, and from that the other side connected to the corner of the wall. Thus the teeth and diagonals of the structure will not be allowed to press the wall with all their force, but will dissipate the impact of the congestion by retaining it.

Furthermore, the interior parts must be constructed toothed against the earth, attached to the wall, so that each tooth is as far from the wall as the height of the substructure. However, the thickness of the tooth structure must be equal to that of the walls. Likewise, at the extreme corners, when the interior corner of the space has been removed to the height of the substructure, it is marked on both sides, and from these marks the structure is placed diagonally, and from this the other half is attached to the corner of the wall. Thus, the teeth and diagonal structures will not be able to press against the wall with their full force, but will dissipate it to avoid the attack of congestion.

8. Quemadmodum sine vitiis opera constitui oporteat et uti caveatur incipientibus exposui. namque de tegulis aut tignis aut asseribus mutandis non est eadem cura quemadmodum de his, quod ea quamvis sunt vitiosa, faciliter mutantur. itaque nec solida quia non putantur esse, quibus rationibus haec poterint esse firma et quemadmodum instituantur exposui.

8. I have explained to beginners how works should be constructed without defects and how precautions should be taken. For there is not the same care in changing tiles or beams or planks as in these, which, although defective, are

easily changed. Therefore, I have explained what are not even supposed to be solid, by what means these could be made firm and how they are constructed.

I have explained how it is necessary for the works to be established without defects and that beginners should use them with caution. For there is not the same care in replacing tiles, beams, or rafters as in these, because they are easily replaced, even if they are defective. Thus, things that are not even assumed to be solid, I have explained why they can be firm and how they are established.

9. quibus autem copiarum generibus oporteat uti, non est architecti potestas, ideo quod non in omnibus locis omnia genera copiarum nascuntur, ut in primo volumine est expositum, praeterea in domini est potestate utrum latericio an caementicio an saxo quadrato velit aedificare. itaque omnium operum probationes tripertito considerantur, id est fabrili subtilitate et magnificentia et dispositione. cum magnificenter opus perfectum aspicietur, a domini potestate inpensae laudabuntur, cum subtiliter, officinatoris probabitur exactio, cum vero venuste proportionibus et symmetriis habuerit auctoritatem, tunc fuerit gloria architecti.

9. The choice of available materials is not entirely within the architect's power, since not every kind is found in every place, as Book I explains. The owner also decides whether to build in brick, rubble masonry, or ashlar. A work is judged under three heads: craftsmanship, magnificence, and arrangement. When a finished building impresses by its magnificence, the owner's expenditure earns praise; when by its precision, the workmanship is commended. When beauty acquires authority through proportion and commensurability, the credit belongs to the architect.

Technical paraphrase of 6.8.9. Material supply and the owner's decision constrain the architect. Vitruvius distinguishes the patron's expenditure, the craftsman's execution, and the architect's achievement in proportionate design. Brick, rubble masonry, and ashlar are alternative forms of construction; caementum here is not modern manufactured cement.

10. haec autem recte constituuntur, cum is et a fabris et ab idiotis patiatur accipere se consilia. namque omnes homines, non solum architecti, quod est bonum possunt probare, sed inter idiotas et eos hoc est discrimen quod idiota nisi factum viderit, non potest scire quid sit futurum, architectus autem simul animo constituerit, antequam inceperit et venustate et usu et decore quale sit futurum habet definitum. Quas res privatis aedificiis utiles putavi et quemadmodum sint faciundae quam apertissime potui perscripsi. de expolitionibus autem eorum uti sint elegantes et sine vitiis ad vetustatem <>, insequenti volumine exponam.

10. But these things are rightly established, since he allows himself to be advised by both craftsmen and laymen. For all men, not only architects, can approve what is good, but the difference between laymen and architects is this: a layman cannot know what will be until he sees it done, while an architect, having already established it in his mind, has defined before he begins what it will be in terms of beauty, use, and decorum. I have described as clearly as I could what things are useful for private buildings and how they should be made. But I will explain their refinements, so that they are elegant and without defects for old age, in the following volume.

Editorial note. — Chapter 8 closes Book VI with the principles of sound construction (*firmitas*): foundations carried to solid ground; relieving arches (fornicationes) and voussoirs (cunei) to lighten the load over lintels and openings; the strict perpendicular of every wall. Its most technical passage concerns substructures and retaining walls against the thrust of earth: Vitruvius prescribes buttresses on the face — anterides, in Greek erismae — and, on the inner side, counterforts toothed into the wall (serratim), each spaced from it by a distance equal to the height of the substructure, so that the earth's pressure is resisted as if by the teeth of a saw. The chapter ends with the famous maxim that the architect should take counsel from craftsmen and laymen alike, for the layman cannot judge a work until it is built, whereas the architect foresees its grace, utility and propriety before it is begun.

Textual note — Book VI. The running Latin is checked against Krohn (1912), and the authorial Spanish translation provides the basis for the English rendering. Climate, optical adjustment, domestic arrangements and structural stability belong to distinct stages of the book's argument. Greek technical terms

are distinguished from their Latin transliterations; references to other modern editions do not certify a complete new collation of their apparatuses.

These aims are properly achieved when the architect accepts advice from craftsmen and laypeople alike. Everyone can judge a completed work, but a layperson cannot know its future form before seeing it built. The architect, by contrast, conceives in advance how it will answer to beauty, use, and propriety.

I have described as clearly as I can the arrangements useful for private buildings and how they should be made. In the next book I shall explain their finishes, so that they remain elegant and free from defects over time.

Argumentum Libri VII — *On finishes: the preparation of pavements and stuccos, lime plasters, ceiling moldings; natural and artificial colors and pigments (ochre, vermilion, purple, verdigris, ceruse) and their correct application.*

Notice. *— Book VII, after a learned preface on plagiarism and the history of writing on architecture, treats the finishing of buildings: pavements and their bedding, the preparation of stucco and the technique of fresco, and the pigments — the natural earths and the manufactured colors, among them the synthetic Egyptian blue (caeruleum) and the lead and copper pigments. It is the most important ancient source on the technique of painting and the chemistry of pigments.*

Critical and structural note — VI.8. Foundations and substructures, uprights, vaults, wedges, piers and anterides or erismae are presented as an ancient constructional system. Modern distinctions between vertical loading, lintel bending, arch thrust and retaining-wall action belong to the explanatory note. Continuity of support can clarify Vitruvius's principle without attributing elastic theory or stress calculation to him. Buttress and tooth proportions remain the prescriptions of the text.

M. VITRVVIVS POLLIO · DE ARCHITECTVRA · LIBER VII

Preface

1. *Maiores cum sapienter tum etiam utiliter instituerunt, per commentariorum relationes cogitata tradere posteris, ut ea non interirent sed singulis aetatibus crescentia voluminibus edita gradatim pervenirent vetustatibus ad summam doctrinarum subtilitatem. itaque non mediocres sed infinitae sunt his agendae gratiae, quod non invidiose silentes praetermiserunt, sed omnium generum sensus conscriptionibus memoriae tradendos curaverunt.*

2. The ancients, both wisely and usefully, instituted the transmission of their thoughts to posterity through the reports of their commentaries, so that they would not perish, but, published in increasing volumes in each age, would gradually reach the highest subtlety of their doctrines. Therefore, the merits of this work are not moderate but infinite, because they did not pass over it in envious silence, but took care to transmit to memory all kinds of thoughts in writings.

2. namque si non ita fecissent, non potuissemus scire quae res in Troia fuissent gestae, nec quid Thales Democritus Anaxagoras Xenophanes reliquique physici sensissent de rerum natura quasque Socrates Platon Aristoteles Zenon Epicurus aliique philosophi hominibus agendae vitae terminationes finissent seu Croesus Alexander Darius ceterique reges quas res aut quibus rationibus gessissent fuissent notae, nisi maiores praeceptorum comparationibus omnium memoriae ad posteritatem commentariis extulissent.

2. For if they had not done so, we would not have been able to know what things had been done in Troy, nor what Thales, Democritus, Anaxagoras, Xenophanes, and the other natural philosophers had thought about the nature of things, nor what Socrates, Plato, Aristotle, Zeno, Epicurus, and other philosophers had concluded the ends of life for men, nor what things Croesus, Alexander, Darius, and the other kings had done, or for what reasons, would have been known, unless the elders had brought forth the memory of all things in their commentaries by comparisons of precepts for posterity.

3. itaque quemadmodum his gratiae sunt agendae, contra qui eorum scripta furantes pro suis praedicant sunt vituperandi, quique non propriis cogitationibus

scriptorum nituntur, sed invidis moribus aliena violantes gloriantur, non modo sunt reprehendendi, sed etiam quia impio more vixerunt, poena condemnandi. nec tamen haec res non vindicatae curiosius ab antiquis esse memorantur. quorum exitus iudiciorum qui fuerint, non est alienum quemadmodum sint nobis traditi explicare.

Just as gratitude is owed to those who transmit their thoughts, so those who steal others' writings and proclaim them their own deserve condemnation. Those who claim glory by violating the work of others, instead of relying on their own ideas, merit not merely reproach but punishment for acting dishonourably. Such offenses, it is reported, did not go unpunished among the ancients. It is therefore appropriate to recount the outcomes of those judgments as they have been handed down to us.

4. reges Attalici magnis philologiae dulcedinibus inducti cum egregiam bybliothecam Pergami ad communem delectationem instituissent, tunc item Ptolomaeus infinito zelo cupiditatisque incitatus studio non minoribus industriis ad eundem modum contenderat Alexandriae comparare. cum autem summa diligentia perfecisset, non putavit id satis esse nisi propagationibus inseminando curaret augendam. itaque Musis et Apollini ludos dedicavit et quemadmodum athletarum sic communium scriptorum victoribus praemia et honores constituit.

4. When the Attalic kings, led by the great delights of philology, had established an excellent library at Pergamum for the common enjoyment, then likewise Ptolemy, inspired by infinite zeal and desire, strove with no less diligence to furnish Alexandria with the same. But when he had accomplished it with the utmost diligence, he did not think that it was sufficient unless he took care to increase it by insemination. Accordingly he dedicated games to the Muses and Apollo, and, as he did to athletes, so he established prizes and honors for the victors of common writings.

5. his ita institutis cum ludi adessent, iudices litterati qui ea probarent erant legendi. rex cum iam sex civitatis lectos habuisset nec tam cito septumum idoneum inveniret, retulit ad eos qui supra bybliothecam fuerunt et quaesiit si quem novissent ad id expeditum. tunc ei dixerunt esse quendam Aristophanen, qui summo studio summaque diligentia cotidie omnes libros ex ordine perlegeret. itaque conventu ludorum cum secretae sedes iudicibus essent distributae, cum ceteris Aristophanes citatus quemadmodum fuerat locus ei designatus sedit.

5. As the games approached, learned judges had to be selected to assess them. The king had already chosen six men from the city but could not readily find a suitable seventh. He consulted those in charge of the library and asked whether they knew anyone qualified. They told him of a certain Aristophanes, who read through all the books in order each day with exceptional diligence and attention. When the games assembled and reserved seats had been assigned to the judges, Aristophanes was summoned with the others and took his appointed place.[160]

6. primo poetarum ordine ad certationem inducto cum recitarentur scripta, populus cunctus significando monebat iudices quod probarent. itaque cum ab singulis sententiae sunt rogatae, sex una dixerunt et quem maxime animadverterunt multitudini placuisse, ei primum praemium, insequenti secundum tribuerunt. Aristophanes vero cum ab eo sententia rogaretur, eum primum renuntiari iussit qui minime populo placuisset.

6. When the first order of poets was brought to the competition, and their writings were recited, the whole people indicated by signs to the judges what they should approve. Accordingly, when each was asked for his opinion, the six gave one, and to him whom they observed had most pleased the multitude, they awarded the first prize, and to the next the second. But Aristophanes, when his opinion was asked of him, ordered that the one who had least pleased the people be dismissed first.

7. cum autem rex et universi vehementer indignarentur, surrexit et rogando impetravit ut paterentur se dicere. itaque silentio facto docuit unum ex his eum esse poetam, ceteros aliena recitavisse, oportere autem iudicantes non furta sed scripta probare. admirante populo et rege dubitante, fretus memoriae certis armariis infinita volumina eduxit et ea cum recitatis conferendo coegit ipsos furatos de se confiteri. itaque rex iussit cum his agi furti condemnatosque cum ignominia dimisit, Aristophanen vero amplissimis muneribus ornavit et supra bybliothecam constituit.

7. But when the king and all were greatly indignant, he rose and begged that they be allowed to speak. So, by making silence, he taught that one of them was a

160 The account concerns Aristophanes of Byzantium (c. 257–180 BCE), the scholar associated with the Library of Alexandria. Vitruvius's anecdote illustrates literary judgment and the condemnation of plagiarism; it should not relocate Aristophanes to Pergamum merely because that library figures elsewhere in the preface.

poet, and that the others had recited other people's works, but that they judged it necessary to prove that they were not stolen but written. With the people astonished and the king doubtful, he, relying on his memory, brought out an infinite number of volumes from certain cupboards and, comparing them with the ones recited, forced the thieves themselves to confess that they had stolen them. So the king ordered that these be tried and those convicted of theft were released with disgrace, but Aristophanes was adorned with the most magnificent gifts and placed over the library.

8. insequentibus annis a Macedonia Zoilus, qui adoptavit cognomen ut Homeromastix vocitaretur, Alexandriam venit suaque scripta contra Iliadem et Odyssean comparata regi recitavit. Ptolomaeus vero cum animadvertisset poetarum parentem philologiaeque omnis ducem absentem vexari et cuius ab cunctis gentibus scripta suspicerentur ab eo vituperari, indignans nullum ei dedit responsum. Zoilus autem cum diutius in regno fuisset, inopia pressus summisit ad regem postulans ut aliquid sibi tribueretur.

8. In the following years, Zoilus, who adopted the surname Homeromastix, came from Macedonia to Alexandria and read his writings against the Iliad and the Odyssey to the king, having prepared them. But Ptolemy, when he perceived that the father of poets and the leader of all philology was being harassed in his absence, and that his writings, whose writings were highly regarded by all nations, were being censured by him, became indignant and gave him no answer. But Zoilus, when he had been in the kingdom for a long time, was pressed by poverty and sent to the king, requesting that something be given to him.

9. rex vero respondisse dicitur Homerum, qui ante annos mille decessisset, aevo perpetuo multa milia hominum pascere, item debere qui meliore ingenio se profiteretur non modo unum sed etiam plures alere posse. et ad summam mors eius ut parricidii damnati varie memoratur. alii enim scripserunt a Philadelpho esse in crucem fixum, nonnulli Chii lapides esse coniectos, alii Zmyrnae vivum in pyram coniectum. quorum utrum ei acciderit, merenti digna constitit poena. non enim aliter videtur promereri qui citat eos quorum responsum, quid senserint scribentes, non potest coram indicari.

9. The king is said to have replied that Homer, who died a thousand years ago, would feed many thousands of men in perpetuity, and that he who would claim

to be superior in genius should be able to feed not only one but also many. And to sum up, his death as a condemned parricide is variously recorded. For some have written that he was crucified at Philadelphia, some that he was stoned at Chios, others that he was thrown alive on a pyre at Smyrna. Whether any of these things happened to him, the punishment he deserved was decidedly worthy. For it does not seem that he deserves otherwise who quotes those whose response, what they thought when writing, cannot be stated in person.

10. ego vero, Caesar, neque alienis indicibus mutatis interposito nomine meo id profero corpus neque ullius cogitata vituperans institui ex eo me adprobare, sed omnibus scriptoribus infinitas ago gratias quod egregiis ingeniorum sollertiis ex aevo conlatis abundantes alius alio genere copias praeparaverunt, unde nos uti fontibus haurientes aquam et ad propria proposita traducentes facundiores et expeditiores habemus ad scribendum facultates talibusque confidentes auctoribus audemus institutiones novas comparare.

10. But I, Caesar, neither do I produce this body with my own name interposed, having altered the evidence of others, nor do I set out to approve myself by criticizing the thoughts of anyone, but I give infinite thanks to all writers, who, with the excellent skills of their geniuses, brought together from time immemorial, have prepared abundant resources of one kind or another, from which we, drawing water as from springs and translating it for our own purposes, have more eloquent and expeditious faculties for writing, and, trusting in such authors, we dare to compare new compositions.

Explanatory note — Bk. 7, preface (intellectual honesty). The preface to Book VII is Vitruvius's manifesto on intellectual property. He thanks his predecessors and condemns those who steal others' work 'by changing the titles of other men's books and inserting their own name.' He illustrates it with a famous Alexandrian anecdote: at a poetic contest the king appoints six judges and, for the seventh, the librarians recommend Aristophanes of Byzantium; while the crowd acclaims the popular reciters, Aristophanes rewards the one true poet and exposes the rest as plagiarists, recalling from memory the exact volumes of the library from which they had copied. He then tells of Zoilus of Amphipolis, nicknamed Homeromastix ('scourge of Homer'), who attacked the Iliad and Odyssey before the king; fallen into poverty, he asked for help, and the king replied that Homer, dead a thousand years, still fed thousands. The passage

connects with Alexandrian philology (Zenodotus, Aristophanes, Aristarchus). The text has been collated with no variant affecting the sense.

Comparative note — Bk. 7, preface. In the Budé, Book VII is the work of Bernard Liou, Marie-Thérèse Cam, and Michel Zuinghedau, whose commentary documents the sources of the catalog of authors and the Alexandrian anecdote. Granger (Loeb) and Rowland–Howe (Cambridge, 1999) stress the preface's value as an ancient testimony on plagiarism and on the Library of Alexandria; Corso–Romano clarify the Ptolemaic chronology (the anecdote conflates Ptolemy I with the earliest Ptolemies). This edition translates in its own voice and keeps the transmitted text, with no variant affecting the sense; the one uncertainty is historical —the exact identity of the king— not textual.

11. Igitur tales ingressus eorum quia ad propositi mei rationes animadverti praeparatos, inde sumendo progredi coepi. namque primum Agatharchus Athenis Aeschylo docente tragoediam scaenam fecit et de ea commentarium reliquit. ex eo moniti Democritus et Anaxagoras de eadem re scripserunt, quemadmodum oporteat ad aciem oculorum radiorumque extentionem certo loco centro constituto lineas ratione naturali respondere, uti de certa re certae imagines aedificiorum in scaenarum picturis redderent speciem et quae in directis planisque frontibus sint figurata, alia abscedentia, alia prominentia esse videantur.

11. Therefore, such were their entrances, because I observed that the reasons for my purpose were prepared, and I proceeded from there with strength. For first Agatharchus, under the instruction of Aeschylus, staged a tragedy in Athens and left a commentary on it. From him, Democritus and Anaxagoras, advised, wrote on the same subject, how it is necessary for lines to correspond by natural reason to the line of sight and the extension of rays, with a center established at a certain place, so that from an uncertain thing certain images of buildings in stage paintings might give the appearance, and those which are figured on straight and flat fronts might seem to be otherwise absurdly prominent.

12. postea Silenus de symmetriis doricorum edidit volumen, de aede Iunonis quae est Sami dorica Theodorus, ionice Ephesi quae est Dianae Chersiphron et Metagenes, de fano Minervae quod est Priene ionicum Pytheos, item de aede Minervae dorice quae est Athenis in arce Ictinos et Carpion, Theodorus Phocaeus

de tholo qui est Delphis, Philo de aedium sacrarum symmetriis et de armamentario quod fuerat Piraei portu, Hermogenes de aede Dianae ionice quae est Magnesia pseudodipteros et Liberi Patris Teo monopteros, item Arcesius de symmetriis corinthiis et ionico Trallibus Aesculapio quod etiam ipse sua manu dicitur fecisse, de Mausoleo Satyrus et Pytheos, quibus vero felicitas maximum summumque contulit munus.

12. Later Silenus published a volume on the symmetries of the Dorics, Theodorus on the temple of Juno, which is the Doric temple of Samos, and Metagenes on the Ionic temple of Ephesus, which is the temple of Diana, Chersiphron and Metagenes, on the temple of Minerva, which is the Ionic temple of Priene, Pytheos, likewise on the Doric temple of Minerva, which is in Athens in the citadel of Ictions and Carpion, Theodore Phocaeus on the tholos which is at Delphi, Philo on the symmetries of sacred buildings and on the armoury which he had made in the port of Piraeus, Hermogenes on the Ionic temple of Diana, which is the temple of Magnesia, and the Theomonopteros of Liberi Patris, Arcesius on the symmetries of Corinth and the Ionic temple of Aesculapius at Trallis, which he himself is said to have made with his own hand, and Satyrs and Pytheos on the Mausoleum, to which, however, fortune bestowed the greatest and most sublime gift.

13. quorum enim artes aevo perpetuo nobilissimas laudes et sempiterno florentes habere iudicantur, ei cogitatis egregias operas praestiterunt. namque singulis frontibus singuli artifices sumpserunt certatim partes ad ornandum et probandum Leochares Bryaxis Scopas Praxiteles, nonnulli etiam putant Timotheum, quorum artis eminens excellentia coegit ad septem spectaculorum eius operis pervenire famam.

13. For their arts are judged to have the most noble praises throughout the ages and to flourish for ever, and they have produced excellent works of design. For on each front, individual artists competed to adorn and prove Leochares, Bryaxis, Scopas, Praxiteles, and some even think Timotheus, whose eminent excellence of art forced the fame of his work to reach seven spectacles.

14. praeterea minus nobiles multi praecepta symmetriarum conscripserunt, uti Nexaris Theocydes Demophilos Pollis Leonidas Silanion Melampus Sarnacus Euphranor. non minus de machinationibus, uti Diades Archytas Archimedes Ctesibios Nymphodorus Philo Byzantius Diphilos Democles Charias Polyidos

Pyrros Agesistratos. quorum ex commentariis quae utilia esse his rebus animadverti, collecta in unum coegi corpus, et ideo maxime, quod animadverti in ea re ab Graecis volumina plura edita, ab nostris oppido quam pauca. Fuficius enim nimirum de his rebus primus instituit edere volumen, item Terentius Varro de novem disciplinis unum de architectura, P. Septimius duo.

14. Moreover, many less noble men wrote precepts on symmetry, such as Theocides of Nexaris, Demophilus, Pollis, Leonidas, Silanion, Melampus, Sarnacus, Euphranor. No less on engineering, such as Diades, Archytas, Archimedes, Ctesibius, Nymphodorus, Philo, Byzantius, Diphilus, Democles, Charias, Polyides, Pyrrhus, Agesistratus. From whose commentaries I have observed to be useful in these matters, I have collected several volumes on this subject published by the Greeks, and more than a few by our own people. Fuficius was the first to undertake to publish a volume on these matters, as was Terentius Varro, one on the nine disciplines, on architecture, and Publius Septimius, two.

15. amplius vero in id genus scripturae adhuc nemo incubuisse videtur, cum fuissent et antiqui cives magni architecti, qui potuissent non minus eleganter scripta comparare. namque Athenis Antistates et Callaeschros et Antimachides et Porinos architecti Pisistrato aedem Iovi Olympio facienti fundamenta constituerunt, post mortem autem eius propter interpellationem reipublicae incepta reliquerunt. itaque circiter annis <quadringentis> post Antiochus rex cum in id opus inpensam esset pollicitus, cellae magnitudinem et columnarum circa dipteron conlocationem epistyliorumque et ceterorum ornamentorum ad symmetriam distributionem magna sollertia scientiaque summa civis Romanus Cossutius nobiliter est architectatus. id autem opus non modo vulgo sed etiam in paucis a magnificentia nominatur.

15. But no one seems to have yet devoted himself more to that kind of writing, since there were also great architects among the ancient citizens who could have produced writings no less elegantly. For at Athens the architects Antistates and Callaeschros and Antimachides and Phormus laid the foundations of the temple of Jupiter Olympias which Pisistratus was building, but after his death they abandoned the projects because of the interruption of the state. Accordingly, about four hundred years later, when King Antiochus had promised to spend on that work, the size of the room and the arrangement of the columns around

the dipteron and the distribution of the epistyles and other ornaments in a symmetrical manner were nobly designed by the Roman citizen Cossutius with great skill and supreme knowledge. And that work is not only popularly but also in a few places by its magnificence.

16. nam quattuor locis sunt aedium sacrarum marmoreis operibus ornatae dispositiones, e quibus propriae de his nominationes clarissima fama nominantur. quorum excellentiae prudentesque cogitationum apparatus suspectus habent in deorum σημαντικοῖς. primumque aedes Ephesi Dianae ionico genere ab Chersiphrone Gnosio et filio eius Metagene est instituta, quam postea Demetrius ipsius Dianae servus et Paeonius Ephesius dicuntur perfecisse. Mileti Apollini item ionicis symmetriis ⟨aedem⟩ idem Paeonius Daphnisque Milesius instituerunt. Eleusine Cereris et Proserpinae cellam inmani magnitudine Ictinos dorico more sine exterioribus columnis ad laxamentum usus sacrificiorum pertexit.

16. For in four places there are arrangements of sacred buildings adorned with marble works, from which the most famous names are properly named. The excellences and prudent arrangements of which are suspected in the ceremony of the gods. The first temple of Diana at Ephesus was erected in the Ionic style by Chersiphron of Gnosius and his son Metagenes, which is said to have been completed afterwards by Demetrius, the servant of Diana herself, and Paeonius of Ephesus. The same was erected in the Ionic style by Paeonius and Daphnis of Miles. The cella of Ceres and Proserpina at Eleusis was built in the Doric style without exterior columns for the relaxation of sacrifices.

17. eam autem postea cum Demetrius Phalereus Athenis rerum potiretur, Philo ante templum in fronte columnis constitutis prostylon fecit. ita aucto vestibulo laxamentum initiantibus operique summam adiecit auctoritatem. in asty vero Olympium amplo modulorum comparatu corinthiis symmetriis et proportionibus, uti supra scriptum est, architectandum Cossutius suscepisse memoratur, cuius commentarium nullum est inventum. nec tamen a Cossutio solum de his rebus scripta sunt desideranda sed etiam a G. Mucio, qui magna scientia confisus aedis Honoris et Virtutis Marianae cellae columnarumque et epistyliorum symmetrias legitimis artis institutis perfecit. id vero si marmoreum fuisset, ut haberet quemadmodum ab arte subtilitatem sic ab magnificentia et inpensis auctoritatem, in primis et summis operibus nominaretur.

17. But later, when Demetrius Phalerum took possession of Athens, Philo built a prostylon in front of the temple with columns set in front. Having thus built the vestibule, he added a great deal of authority to the workmen who were beginning it. But in Asty, when the Olympos were compared in ample dimensions with the Corinthian symmetries and proportions, as has been written above, it is recorded that Cossutius undertook to design the architectur, of which no commentary has been found. And yet, not only Cossutius is to be missed in writings on these matters, but also Gaius Mucius, who, relying on great knowledge, completed the symmetry of the columns and epistyles of the temple of Honor and Virtue of Mariana, according to the legitimate rules of art. But if it had been made of marble, so that it would have authority from magnificence and expense, as well as from subtlety of art, it would have been named among the first and greatest works.

18. Cum ergo et antiqui nostri inveniantur non minus quam Graeci fuisse magni architecti et nostra memoria satis multi, et ex his pauci praecepta edidissent, non putavi silendum sed disposite singulis voluminibus de singulis exponere. rebus itaque quoniam sexto volumine privatorum aedificiorum rationes perscripsi, in hoc qui septimum tenet numerum de expolitionibus quibus rationibus et venustatem et firmitatem habere possint exponam.

18. Since, therefore, our ancients are found to have been no less great architects than the Greeks, and there are quite a few of them in our memory, and of these few have published precepts, I did not think it necessary to be silent, but to explain each one in order in each volume. Therefore, since in the sixth volume I have written down the methods of private buildings, in this, which contains the seventh volume, I will explain the refinements by which they can have both beauty and strength.

Critical note — VII, preface. The preface establishes the transmission of technical knowledge, condemns plagiarism and constructs a genealogy of writers on architecture, perspective and artistic theory. Its function in the treatise is substantive, not an expendable digression. The Aristophanes anecdote is read within that argument; ancient literary judgment and independently verified library history remain distinct.

Chapter 1

1. *Primumque incipiam de ruderatione, quae principia tenet expolitionum, uti curiosius summaque providentia solidationis ratio habeatur. et si plano pede erit eruderandum, quaeratur solum si sit perpetuo solidum, et ita exaequetur, et inducatur cum statumine rudus. sin autem omnis aut ex parte congesticius locus fuerit, fistucationibus•cum magna cura solidetur. in contignationibus vero diligenter est animadvertendum ne qui paries qui non exeat ad summum, sit extructus sub pavimentum, sed potius relaxatus supra se pendentem habeat coaxationem. cum enim solidus exit, contignationibus arescentibus aut pandatione sidentibus, permanens structurae soliditate dextra ac sinistra secundum se facit in pavimentis necessario rimas.*

Archaeological note — Bk. 7.1 (pavements). Vitruvius transmits the ancient recipe for the layered Roman floor, which archaeology confirms across the Empire (from Fishbourne in Britain to Lod in Israel, from Zippori to Braga). From the bottom up: the statumen (large stones forming the base and draining ground moisture); the rudus or ruderatio (a mortar of broken brick and lime, more than 20 cm thick, rammed down —three parts lime to one if fresh, five if recycled—); the nucleus (a fine layer of three parts crushed potsherd to one of lime, some 15 cm); and above it the setting bed where the tesserae of the pavimentum were fixed. On upper floors the whole is laid over the joists. A key material here is opus signinum (cocciopesto): lime with crushed terracotta, waterproof, of Punic North African origin, spread through Sicily and Italy and used both for floors and for cisterns. The Vitruvian stratigraphy remains the reference framework for the archaeometry of mosaics.

2. And first I will begin with the roughening, which holds the principles of the refinements, so that the reason for the solidification may be more carefully and with the utmost foresight. And if it is to be smoothed with a flat foot, let it be sought only if it is permanently solid, and so it is leveled, and it is judged to be rough with a firm foundation. But if the whole or part of the place is congested, it is solidified with great care by fusing. In floors, however, it is to be diligently observed that no wall which does not come out to the top is built under the pavement, but rather has a loose coaxation hanging above it. For when it comes out solid, with floors drying out or settling, the permanent structure with solidity necessarily makes cracks in the pavements to the right and left.

2. item danda est opera ne commisceantur axes aesculini querco, quod quercei simul umorem perceperunt se torquentes rimas faciunt in pavimentis. sin autem aesculus non erit et necessitas coegerit, propter inopiam querceis ⟨uti⟩ sic videtur esse faciundum ut secentur tenuiores. quo minus enim valuerint, eo facilius clavis fixi continebuntur deinde in singulis tignis extremis partibus axis bini clavi figantur, uti nulla ex parte possint se torquendo anguli excitare. namque de cerro aut fago seu farno nullus ad vestutatem potest permanere. coaxationibus factis si erit, filex, si non, palea substernatur, uti materies ab calcis vitiis defendatur.

2. Also, care must be taken not to mix the axes of the aesculinus with the oak, because the oaks, having perceived the moisture at the same time, twist themselves and make cracks in the floors. But if the aesculinus is not available and necessity compels, due to the scarcity of oaks it seems that it is necessary to cut them thinner. For the weaker they are, the more easily they will be held fixed with nails. Then the axes are fixed with two nails in each of the extreme parts of the beams, so that they cannot raise the corners by twisting from any side. For none of the fir, beech or fir can last for a long time. After the coaxings have been made, if there is one, it is covered with straw, if not, so that the materials are protected from the defects of lime.

3. tunc insuper statuminetur ne minore saxo quam qui possit manum implere. statuminationibus inductis rudus si novum erit, ad tres partes una calcis misceatur, si redivivum fuerit, quinque ad duo mixtionis habeant responsum. deinde rudus inducatur et vectibus ligneis, decuriis inductis, crebriter pistatione solidetur, et id non minus pinsum absolutum crassitudine sit dodrantis. insuper ex testa nucleus inducatur mixtionem habens ad tres partes unam calcis, ne minore crassitudine [pavimentum] digitorum senûm. supra nucleum ad regulam et libellam exacta pavimenta struantur sive sectilia seu tesseris.

3. Then, in addition, let it be determined that it should not be made with a smaller stone than can fill the hand. After the determinations, if the raw material is new, it should be mixed with one part lime to three parts, if it is recycled, five parts to two parts of the mixture should be the answer. Then, the raw material should be introduced and solidified with wooden bars, boards, and frequent pounding, and that the absolute paste should not be less than the thickness of the dodrant. In addition, a core of the shell should be introduced, containing one part lime to three parts, so that the thickness of the pavement is less than the

fingers of the old man. On top of the core, floors should be built, using a rule and a level, whether it is made of tiles or tiles.

4. cum ea structa fuerint et fastigia sua ex structione habuerint, ita fricentur uti si sectilia sint, nulli gradus in scutulis aut trigonis aut quadratis seu favis extent, sed coagmentorum compositio planam habeat inter se directionem. si tesseris structum erit, ut eae omnes angulos habeant aequales. cum enim anguli non fuerint omnes aequaliter plani, non erit exacta ut oportet fricatura. item testacea spicata tiburtina sunt diligenter exigenda, ut ne habeant lacunas nec extantes tumulos, sed <sint> extenta et ad regulam perfricata. super fricaturam, levigationibus et polituris cum fuerint perfecta, incernatur marmor, et supra loricae ex calce et harena inducantur.

4. When they have been built, the peaks will have their own structure, and they will be rubbed so that if they are sectile, no steps in the scrolls or triangles or squares or honeycombs will extend, but the composition of the joints will have a flat direction between them. If it is built with tiles, it will be so that all of them have equal angles. For since the angles will not all be equally flat, the rubbing will not be as exact as it should be. Likewise, the spiked shells of Tiburtine must be carefully removed, so that they do not have gaps or protruding mounds, but <are> extended and rubbed to the rule. Marble is laid on top, and on top of them are placed armour plates made of lime and sand.

5. Subdiu vero maxime idonea faciunda sunt pavimenta, quod contignationes umore crescentes aut siccitate decrescentes seu pandationibus sidentes movendo se faciunt vitia pavimentis, praeterea gelicidia et pruinae non patiuntur integra permanere. itaque si necessitas coegerit, ut minime vitiosa fiant sic erit faciundum. cum coaxatum fuerit, super altera coaxatio transversa sternatur clavisque fixa duplicem praebeat contignationi loricationem. deinde ruderi novo tertia pars testae tunsae admisceatur calcisque duae partes ad quinque mortarii mixtionibus praestent responsum.

5. But the most suitable pavements should be made in the long term, because floors that increase with moisture or decrease with dryness or that sit on supports by moving themselves cause defects in the pavements, and furthermore frost and frost do not allow them to remain intact. Therefore, if necessity compels them, so that they become the least defective, this is what should be done. When it has been compacted, another compaction is laid across

it and nails are fixed to provide a double location for the pavement. Then a third part of crushed stone is mixed with new rubble and two parts of lime to five parts of mortar are mixed to provide the answer.

6. statuminatione facta, rudus inducatur, idque pistum absolutum ne minus pede sit crassum. tunc autem nucleo inducto, uti supra scriptum est, pavimentum e tessera grandi circiter binûm digitûm caesa struatur fastigium habens in pedes denos digitos binos, quod si bene temperabitur et recte fricatum fuerit, ab omnibus vitiis erit tutum. uti autem inter coagmenta materies ab gelicidiis ne laboret, fracibus quotannis ante hiemem saturetur. ita non patietur in se recipere gelicidii pruinam.

6. Having made the determination, the rough is introduced, and the finished dough is not less than a foot thick. Then, after the core has been introduced, as is written above, a floor is built from a large tile cut about two inches thick, having a ridge of ten inches on each foot, which, if well tempered and properly rubbed, will be safe from all defects. But so that the materials between the joints do not suffer from frost, it is saturated with broken pieces every year before winter. In this way it will not be allowed to receive frost from the frost.

7. sin autem curiosius videbitur fieri oportere, tegulae bipedales inter se coagmentatae supra rudus substrata materia conlocentur habentes singulis coagmentorum frontibus excelsos canaliculos digitales. quibus iunctis inplicetur calx ex oleo subacta confricenturque inter se coagmenta compressa. ita calx quae erit haerens in canalibus durescendo contexteque solidescendo non patietur aquam neque aliam rem per coagmenta transire. cum ergo fuerit hoc ita perstratum, supra nucleus inducatur et virgis caedendo subigatur. supra autem sive ex tessera grandi sive ex spica testacea ⟨pavimenta⟩ struantur fastigiis quibus est supra scriptum, et cum sic erunt facta, non cito vitiabuntur.

7. If a more careful construction is required, lay closely jointed two-foot tiles over the prepared bedding on the rudus. Give the meeting edges finger-wide grooves. Work oil-tempered lime into these grooves and rub the joints together under pressure. As the lime hardens into a continuous bond, it prevents water or other matter from passing through. Spread the nucleus over the tiles and compact it by beating with rods. Above it, lay

either large tesserae or a herringbone pavement of fired clay, with the falls prescribed earlier. A floor made in this way will not readily deteriorate.

Critical and constructional note — VII.1. Statumen, rudus and nucleus designate different layers. In reused rudus, two parts of lime are mixed with five of aggregate; exterior rudus has a minimum thickness of one foot, tesserae are about two fingers, and the stated fall is two fingers over ten feet. The supplement ⟨pavimenta⟩ retains its editorial status. These measures constitute an ancient prescription rather than a contemporary standard, and should not be flattened into the generic terms ‘floor’ or ‘mortar’.

Chapter 2

1. *Cum a pavimentorum cura discessum fuerit, tunc de albariis operibus est explicandum. id autem erit recte, si glaebae calcis optimae ante multo tempore quam opus fuerit macerabuntur, uti si qua glaeba parum fuerit in fornace cocta, in maceratione diuturna liquore defervere coacta uno tenore concoquatur. namque cum non penitus macerata sed recens sumitur, cum fuerit inducta habens latentes crudos calculos pustulas emittit. qui calculi in opere uno tenore cum permacerantur, dissolvunt et dissipant tectorii politiones.*

2. After the construction of pavements, lime finishing must be explained. Soak the best lumps of lime well before they are needed. Any lump insufficiently burned in the kiln can then be thoroughly slaked by prolonged contact with water. Fresh lime used before it is fully soaked contains hidden unslaked particles that form blisters after application. As those particles finally slake within the work, they disrupt and break up the plaster finish.

2. cum autem habita erit ratio macerationis et id curiosius operi praeparatum erit, sumatur ascia et quemadmodum materia dolatur, sic calx in lacu macerata ascietur. si ad eam offenderint calculi, non erit temperata. cumque siccum et purum ferrum educetur, indicabit eam evanidam et siticulosam. cum vero pinguis fuerit et recte macerata, circa id ferramentum uti glutinum haerens omni ratione probabit se esse temperatam. tunc autem machinis comparatis camerarum dispositiones in conclavibus expediantur, nisi lacunariis ea fuerint ornata.

2. Once the soaking has been carefully completed, take an adze and test the lime in its pit as one would hew timber. If the tool strikes hard particles, the lime is not properly prepared. If the iron emerges dry and clean, the lime is lean and thirsty. If the lime is rich and thoroughly slaked, it clings to the tool like glue, showing that it is ready. Then prepare the supporting apparatus and set out the vaulted ceilings in the rooms, unless they are to have coffered ceilings.

Critical note — VII.2. Albarium opus denotes white lime finishing. Prolonged soaking and the test with an ascia are preserved as empirical checks on the lime's

preparation and homogeneity. A modern chemical account of slaking can assist the commentary, but does not replace the ancient procedure in translation.

Chapter 3

1. Cum ergo camerarum postulabitur ratio, sic erit faciundum. asseres directi disponantur inter se ne plus spatium habentes pedes binos, et hi maxime cupressei, quod abiegnei ab carie et ab vetustate celeriter vitiantur, hique asseres cum ad formam circinationis fuerint distributi, catenis dispositis ad contignationes, sive tecta erunt, crebriter clavis ferreis fixi religentur, eaeque catenae ex ea materia comparentur cui nec

1. Where a vaulted ceiling is required, set straight wooden laths no more than two feet apart. Cypress is preferable, since fir is quickly damaged by decay and age. Arrange the laths to the curve of the vault and attach them to the floor or roof framing with closely fixed iron nails and wooden hangers. Choose wood for those hangers that is resistant to

caries nec vetustas nec umor possit nocere, id est e buxo iunipero olea robore cupresso ceterisque similibus praeter quercum, cum ea se torquendo rimas faciat quibus inest operibus.

decay, age, and moisture: boxwood, juniper, olive, robur, cypress, and similar woods. Exclude the wood Vitruvius calls quercus, since its twisting causes cracks in the work to which it is attached.

2. asseribus dispositis tum tomice ex sparto hispanico harundines graecae tunsae ad eos uti forma postulat religentur. item supra cameram materies ex calce et harena mixta subinde inducatur, ut si quae stillae ex contignationibus aut tectis ceciderint sustineantur. sin autem harundinis graecae copia non erit, de paludibus tenues colligantur et mataxae tomice ad iustam longitudinem una crassitudine alligationibus temperentur, dum ne plus inter duos nodos [alligationibus] binos pedes distent, et hae ad asseres, uti supra scriptum est, tomice religentur cultellique lignei in eas configantur. cetera omnia uti supra scriptum est expediantur.

2. Once the laths are in place, bind crushed Greek reeds to them with cords of Spanish esparto, following the required curve. Apply a mixture of lime and sand above the vault to catch any drops falling from the floor or roof above. If Greek reeds are unavailable, gather slender marsh reeds and tie them into bundles of even thickness and suitable length, keeping

the ties no more than two feet apart. Bind these bundles to the laths in the same manner and fix wooden slips into them. Complete the remaining work as described above.

3. Cameris dispositis et intextis, imum caelum earum trullissetur, deinde harena dirigatur, postea autem creta aut marmore poliatur. Cum camerae politae fuerint, sub eas coronae sunt subiciendae, quas maxime tenues et subtiles oportere fieri videbitur. cum enim grandes sunt, pondere deducuntur nec possunt se sustinere. in hisque minime gypsum debet admisceri, sed ex creto marmore uno tenore perduci, uti ne praecipiendo non patiatur uno tenore opus inarescere. etiamque cavendae sunt in cameris priscorum dispositiones, quod earum planitiae coronarum <> gravi pondere inpendentes sunt periculosae.

3. Once the vaults have been framed and woven, apply a rough coat to their undersides, level them with sand plaster, and finish with chalk or marble. Beneath the finished vaults, form cornices as thin and light as possible: large cornices are pulled down by their own weight and cannot support themselves. Mix no gypsum into them; use sifted marble throughout, so that premature setting does not prevent the work from drying uniformly. Avoid the old arrangements of vaulted ceilings, whose projecting cornices are dangerous because of their weight.

4. Coronarum autem sunt < figurae aliae purae> aliae caelatae. conclavibus autem ubi ignis aut plura lumina sunt ponenda, purae fieri debent, ut eo facilius extergeantur. in aestivis et exhedris, ubi minime fumus est nec fuligo potest nocere, ibi caelatae sunt faciendae, semper enim album opus propter superbiam candoris non modo ex propriis sed etiam alienis aedificiis concipit fumum.

4. Cornices may be ⟨plain or⟩ carved. In rooms where fires or many lamps will be used, make them plain so that they can be cleaned more easily. In summer rooms and exedras, where smoke and soot cause less harm, carved cornices are appropriate. The brilliance of white plaster makes smoke apparent, whether it comes from the building itself or from neighboring buildings.

5. Coronis explicatis parietes quam asperrime trullissentur, postea autem supra, trullissatione subarescente, deformentur directiones harenati, uti longitudines ad

regulam et ad lineam, altitudines ad perpendiculum, anguli ad normam respondentes exigantur. namque sic emendata tectoriorum in picturis erit species. subarescente, iterum et tertio inducatur. ita cum fundatior erit ex harenato directura, eo firmior erit ad vetustatem soliditas tectorii.

5. After completing the cornices, give the walls a rough coat. As it begins to dry, apply and straighten the sand-plaster coat, checking horizontal lines with rule and string, verticals with the plumb line, and corners with the square. This improves the appearance of the painted finish. When the coat has partly dried, apply a second and a third. The more substantial this sand-plaster foundation, the more durable the finished plaster will be.

6. cum ab harena praeter trullissationem non minus tribus coriis fuerit deformatum, tunc e marmore graneo directiones sunt subigendae, dum ita materies temperetur uti cum subigatur non haereat ad rutrum, sed purum ferrum e mortario liberetur. grandi inducto et inarescente, alterum corium mediocre dirigatur. id cum subactum fuerit et bene fricatum, subtilius inducatur. ita cum tribus coriis harenae et item marmoris solidati parietes fuerint, neque rimas neque aliud vitium in se recipere poterunt.

6. After at least three sand-plaster coats have been applied in addition to the rough coat, work on a coat of coarse marble plaster. Mix it so that it does not cling to the trowel, but leaves the iron clean when lifted from the mixing vessel. When this coarse coat has been applied and has begun to dry, level on a medium-grained coat. After that has been worked and rubbed smooth, apply a finer one. Walls built up with three coats of sand plaster and three of marble plaster resist cracking and other defects.

7. sed et liaculorum subactionibus fundata soliditate marmorisque candore firmo levigata, coloribus cum politionibus inductis nitidos expriment splendores. colores autem, udo tectorio cum diligenter sunt inducti, ideo non remittunt sed sunt perpetuo permanentes, quod calx in fornacibus excocto liquore facta raritatibus evanida, ieiunitate coacta corripit in se quae res forte contigerunt, mixtionibusque ex aliis potestatibus conlatis seminibus seu principiis una solidescendo, in quibuscumque membris est formata cum fit arida redigitur uti sui generis proprias videatur habere qualitates.

7. Thorough working with the polishing tools gives the finish solidity, while the whiteness of the marble produces a smooth, bright surface. Colors applied as the finish is polished acquire a brilliant sheen. When carefully laid on wet plaster, they remain fast rather than fading. Vitruvius explains this by the lime's porous, thirsty condition after its moisture has been driven out in the kiln: it draws in substances that come into contact with it. Their constituent principles combine as the material hardens, so that the dry surface seems to possess the colors as qualities of its own.

8. itaque tectoria quae recte sunt facta neque vetustatibus fiunt horrida, neque cum extergentur remittunt colores, nisi si parum diligenter et in arido fuerint inducti. cum ergo ita in parietibus tectoria facta fuerint uti supra scriptum est, et firmitatem et splendorem et ad vetustatem permanentem virtutem poterunt habere. cum vero unum corium harenae et unum minuti marmoris erit inductum, tenuitas eius minus valendo faciliter rumpitur nec splendorem politionibus propter inbecillitatem crassitudinis proprium obtinebit.

8. Properly made plaster does not roughen with age or lose its colors when wiped, unless the pigments were applied carelessly or to a dry surface. Walls finished by the method described above retain strength, brilliance, and lasting quality. If only one sand-plaster coat and one fine marble coat are used, the thin finish readily cracks and lacks the substance needed to acquire the brilliance of a well-polished surface.

9. quemadmodum enim speculum argenteum tenui lamella ductum incertas et sine viribus habet remissiones splendoris, quod autem e solida temperatura fuerit factum, recipiens in se firmis viribus politionem fulgentes in aspectu certasque considerantibus imagines reddet, sic tectoria quae ex tenui sunt ducta materia non modo sunt rimosa, sed etiam celeriter evanescunt, quae autem fundata harenationis et marmoris soliditate sunt crassitudine spissa, cum sunt politionibus crebris subacta, non modo sunt nitentia, sed etiam imagines expressas aspicientibus ex eo opere remittunt.

9. A silver mirror made from a thin sheet gives faint, uncertain reflections, whereas one of substantial material takes a firm polish and returns clear,

brilliant images. Plaster is similar: a thin coating cracks and soon deteriorates. A thick finish founded on solid sand and marble coats, repeatedly worked and polished, not only shines but reflects distinct images to the viewer.

10. Graecorum vero tectores non solum his rationibus utendo faciunt opera firma, sed etiam mortario conlocato, calce et harena ibi confusa, decuria hominum inducta, ligneis vectibus pisant materiam, et ita ad certamen subacta tunc utuntur. itaque veteribus parietibus nonnulli crustas excidentes pro abacis•utuntur, ipsaque tectoria abacorum et speculorum divisionibus circa se prominentes habent expressiones.

10. Greek plasterers strengthen their work not only by these methods. They also mix lime and sand in a mixing vessel and set a gang of ten men to pound it with wooden rammers. After this vigorous working, they use the mixture. Some people cut panels from old walls and reuse them; their plaster surfaces carry raised moldings around divisions into panels and mirror-like fields.

11. Sin autem in craticiis tectoria erunt facienda, quibus necesse est in arrectariis et transversariis rimas fieri, ideo quod luto cum linuntur necessario recipiunt umorem, cum autem arescunt extenuati in tectoriis faciunt rimas, id ut non fiat haec erit ratio. cum paries totus luto inquinatus fuerit, tunc in eo opere cannae clavis muscariis perpetuae figantur, deinde iterum luto inducto si priores transversariis harundinibus fixae sunt, secundae erectis figantur et ita, uti supra scriptum est, harenatum et marmor et omne tectorium inducatur. ita cannarum duplex in parietibus harundinibus transversis fixa perpetuitas nec segmina nec rimam ullam fieri patietur.

11. Plaster applied to wattle partitions is liable to crack along the uprights and crosspieces. These absorb moisture when coated with clay and then shrink as they dry, splitting the finish. To prevent this, coat the whole wall with clay and fasten a continuous layer of reeds with broad-headed nails. Apply another clay coat and fix a second reed layer across the first: if the first reeds run horizontally, set the second vertically. Then apply the sand plaster, marble coats, and complete finish as described above. These

two continuous layers of reeds, fixed across one another, prevent breaks and cracks.

Critical and constructional note — VII.3. Asseres, harundines, tomex, trullissatio, harenatum and the successive marble coats are distinct materials and operations. The supplement ⟨aliae purae⟩ at VII.3.4 remains explicit. Three sand coats and the subsequent marble layers form a material sequence central to the argument and must not be reduced to a general reference to plaster or stucco.

Chapter 4

1. *Quibus rationibus siccis locis tectoria oporteat fieri dixi, nunc quemadmodum umidis locis politiones expediantur ut permanere possint sine vitiis, exponam. et primum conclavibus quae plano pede fuerint, in imo pavimento alte circiter pedibus tribus pro harenato testa trullissetur et dirigatur, uti eae partes tectoriorum ab umore ne vitientur. sin autem aliqui paries perpetuos habuerit umores, paululum ab eo recedatur et struatur alter tenuis distans ab eo quantum res patietur, et inter duos parietes canalis ducatur inferior quam libramentum conclavis fuerit, habens nares ad locum patentem. item cum in altitudinem perstructus fuerit, relinquantur spiramenta. si enim non per nares umor et in imo et in summo habuerit exitus, non minus in nova structura se dissipabit. his perfectis paries testa trullissetur et dirigatur et tunc tectorio poliatur.*

2. I have explained how plaster finishes should be made in dry places. I shall now describe their treatment in damp places so that they remain sound. In ground-floor rooms, apply and level a crushed-tile plaster instead of sand plaster on the lower part of the wall, to about three feet above the floor. This protects the finish from moisture. Where a wall remains continuously damp, build a second, thin wall a short distance in front of it, as space permits. Between the walls, run a channel below floor level with vents to the open air, and leave ventilation openings at the top. Without outlets both below and above, moisture will spread through the new work as well. When these provisions are complete, rough-coat and level the wall with crushed-tile plaster, then apply the finish.

2. sin autem locus non patietur structuram fieri, canales fiant et nares exeant ad locum patentem. deinde tegulae bipedales ex una parte supra marginem canalis inponantur, ex altera parte besalibus <laterculis> pilae substruantur, in quibus duarum tegularum anguli sedere possint, et ita a pariete eae distent ut ne plus pateant palmum. deinde insuper erectae mammatae tegulae ab imo ad summum ad parietem figantur, quarum interiores partes curiosius picentur ut ab se respuant liquorem. item in imo et in summo supra camaram habeant spiramenta.

2. If there is not enough space to build another wall, make channels with vents opening to the outside. Lay two-foot tiles with one side resting on the channel's edge; support the other side on piers of eight-inch bricks, so that the corners of two tiles can rest on each pier. Keep the tiles no more than a palm's breadth from the wall. Above these, fix studded tiles upright against the wall from bottom to top, carefully coating their inner surfaces with pitch to repel moisture. Provide ventilation openings both at the bottom and at the top, above the vault.

3. tum autem calce ex aqua liquida dealbentur, uti trullissationem testaceam non respuant. namque propter ieiunitatem quae est a fornacibus excocta non possunt recipere nec sustinere, nisi calx subiecta utrasque res inter se conglutinet et cogat coire. trullissatione inducta pro harenato testa dirigatur, et cetera omnia uti supra scripta sunt in tectorii rationibus perficiantur.

3. Then they are whitened with lime from liquid water, so that they do not reject the earthenware trowel. For because of the fastness which is produced by the kilns, they cannot receive or withstand it, unless the lime applied adheres both things to each other and forces them to come together. The trowel is then applied instead of the sanded one, and all the other things are carried out as written above in the rules for roofers.

4. Ipsi autem politionibus eorum ornatus proprios debent habere ad decoris rationes, uti et ex locis aptas et generum discriminibus non alienas habeant dignitates. tricliniis hibernis non est utilis compositione nec megalographia nec camerarum coronario opere subtilis ornatus, quod ea et ab ignis fumo et ab luminum crebris fuliginibus corrumpuntur. in his vero supra podia abaci•ex atramento sunt subigendi et poliendi, cuneis silaceis seu miniaceis interpositis. et explicandae camerae pure politae, etiam pavimentorum non erit displicens, si qui animadvertere voluerit, Graecorum hibernaculorum usum minime sumptuosus et utilis apparatus.

4. But their decorations should have their own reasons for decoration, so that they may have dignities that are appropriate to the place and not alien to the differences of gender. In winter dining rooms, neither large-scale painting nor subtle decoration in the crowning work of the chambers is useful in composition, because they are corrupted by the smoke of the fire and by the

frequent soot of the lights. In these, however, the above podiabaci are to be subjected and polished with ink, with wedges of siliceous or miniaceous interposed. The chamber, when explained, is clean and polished, and even the pavements will not be displeasing, if anyone wishes to observe, the least costly and useful equipment of the Greeks for the use of winter quarters.

5. foditur enim infra libramentum triclinii altitudo circiter pedum binûm, et solo festucato•inducitur aut rudus aut testaceum pavimentum ita fastigatum ut in canali habeat nares. deinde congestis et spisse calcatis carbonibus inducitur e sabulone et calce et favilla mixta materies crassitudine semipedali. ad regulam et libellam summo libramento cote despumato redditur species nigri pavimenti. ita conviviis eorum et quod poculis et pytismatis effunditur simul cadit siccescitque, quique versantur ibi ministrantes etsi nudis pedibus fuerint, non recipiunt frigus ab eius modi genere pavimenti.

5. For a pit is dug below the dining room level to a depth of about two feet, and on the ground is laid either a rough or earthen floor, so leveled that it has holes in the channel. Then, with heaped and thickly trodden coals, a mixture of sand, lime and ash is laid to a thickness of half a foot. With a ruler and a level, the appearance of a black floor is rendered by skimming the foam from the top of the level. Thus, at their banquets, whatever is poured into cups and bowls falls down and dries up at the same time, and those who are there serving, even if they are barefoot, do not receive the cold from that kind of floor.

Critical note — VII.4. In damp places, sand, crushed pottery, the rough coat and finishing layers remain differentiated. Double walls, channels, cavities and moisture removal are ancient techniques. Expressions such as ‘vapor barrier’ may serve a clearly identified modern comparison, but should not replace the transmitted procedure or supply an unrecorded thickness.

Chapter 5

1. *Ceteris conclavibus id est vernis autumnalibus aestivis, etiam atriis et peristylis constitutae sunt ab antiquis ex certis rebus certae rationes picturarum. namque pictura imago fit eius quod est seu potest esse, uti homines, aedificia, naves reliquarumque rerum, e quibus, finitis certisque corporibus, figurata similitudine sumuntur exempla. ex eo antiqui qui initia expolitionibus instituerunt imitati sunt primum crustarum marmorearum varietates et conlocationes, deinde coronarum siliculorum cuneorum inter sese varias distributiones.*

2. For other rooms, that is, for spring, autumn, and summer, and also for atriums and peristyles, the ancients established certain types of paintings from certain things. For painting is an image of what is or can be, such as a man, a building, a ship, and other things, from which, having finite and certain bodies, examples are gathered in figured likeness. From this the ancients, who began the refinements, imitated first the varieties and arrangements of marble crusts, then the various distributions of crowns and wedges of siliceous stone among themselves.

2. postea ingressi sunt ut etiam aedificiorum figuras, columnarum et fastigiorum eminentes proiecturas imitarentur, patentibus autem locis uti exhedris propter amplitudines parietum scaenarum frontes tragico more aut comico seu satyrico designarent, ambulationibus vero propter spatia longitudinis varietatibus topiorum ornarent ab certis locorum proprietatibus imagines exprimentes. pinguntur enim portus promunturia litora flumina fontes euripi fana luci montes pecora pastores, nonnulli loci item signorum megalographiam habent et deorum simulacra seu fabularum dispositas explicationes, non minus troianas pugnas seu Ulixis errationes per topia, ceteraque quae sunt eorum similibus rationibus ab rerum natura procreata.

2. Later, painters began to imitate the forms of buildings and the projecting members of columns and pediments. On the broad walls of open rooms such as exedras, they represented stage facades in the tragic, comic, or satyric manner. Along walks, whose length offered greater scope, they painted varied landscapes drawn from the distinctive features of particular places: harbors, promontories, shores, rivers, springs, canals,

sanctuaries, groves, mountains, flocks, and shepherds. Some settings also contain large-scale figure paintings, images of gods, or ordered scenes from myths, including the battles at Troy and the wanderings of Ulysses through landscapes, together with other subjects drawn on similar principles from the natural world.

3. sed haec quae ex veris rebus exempla sumebantur, nunc iniquis moribus inprobantur. nam pinguntur tectoriis monstra potius quam ex rebus finitis imagines certae. pro columnis enim struuntur calami, striati cum crispis foliis et volutis, pro fastigiis appagineculi item candelabra aedicularum sustinentia figuras, supra fastigia eorum surgentes ex radicibus cum volutis <> teneri flores habentes in se sine ratione sedentia sigilla, non minus coliculi dimidiata habentes sigilla alia humanis alia bestiarum capitibus.

3. But these subjects, once drawn from real things, are now condemned by a depraved taste. For upon the plaster are painted monstrosities rather than truthful images of definite things: reeds are set up in place of columns; in place of pediments, fluted scrolls with curling leaves and volutes; candelabra bearing the figures of little shrines; and, above their pediments, springing from roots, a multitude of slender stalks with volutes, bearing for no reason little seated figures, and other stalks half-human and half-animal in their heads.

4. haec autem nec sunt nec fieri possunt nec fuerunt.. quemadmodum enim potest calamus vere sustinere tectum aut candelabrûm ornamenta fastigii seu coliculus tam tenuis et mollis sustinere sedens sigillum aut de radicibus et coliculis ex parte flores dimidiataque sigilla procreari? at haec falsa videntes homines non reprehendunt sed delectantur, neque animadvertunt si quid eorum fieri potest necne. ergo ita novi mores coegerunt, uti inertiae mali iudices convincerent artium virtutes. iudiciis autem infirmis obscuratae mentes non valent probare quod potest esse cum auctoritate et ratione decoris. neque enim picturae probari debent quae non sunt similes veritati, nec si factae sunt elegantes ab arte, ideo de his statim debet recte iudicari, nisi argumentationis certas rationes habuerint sine offensionibus explicatas.

Yet such things do not exist, cannot exist and have never existed. How can a reed truly support a roof, a candelabrum the ornaments of a pediment, or a stalk so slender and soft a seated figure? How can flowers and half-figures grow from roots and stalks? Yet people look at these falsehoods without criticism and take

pleasure in them, never considering whether any of them could exist. New fashions have thus led bad judges to condemn artistic excellence as ineptitude. Minds obscured by unsound judgment cannot recognize what may properly exist in accordance with the principles of decor. Paintings that bear no resemblance to reality should not be approved; nor, merely because they are elegantly executed, should they immediately be judged sound unless their subjects can be explained by coherent reasoning without inconsistency.

Explanatory note — Bk. 7.5 (the critique of wall-painting). This is one of the most cited passages in the history of ancient art. Vitruvius condemns the pictorial fashion of his own day —the so-called 'Second' and above all 'Third' Pompeian style in August Mau's modern classification—: instead of images drawn from real things, monstra ('monsters') are painted. He lists the fantasies: reeds in place of columns; instead of pediments, curling stalks with leaves and volutes; candelabra supporting little shrines; stalks from which figurines sprout for no reason, half-figures with human or animal heads. His reproach is one of truth and decorum: 'such things neither are, nor can be, nor have been' (haec autem nec sunt nec fieri possunt nec fuerunt), since a reed cannot hold up a roof. In time these very fantasies, found in the Domus Aurea, would inspire the Renaissance grottesche. [The author's personal hermeneutic proposal: to read the passage as proof of a general decline of taste belongs to interpretation, not to the datum.] The text has been collated with no variant affecting the sense.

Comparative note — Bk. 7.5 (wall-painting). In the Budé, Book VII is the work of Bernard Liou, Marie-Thérèse Cam, and Michel Zuinghedau, whose commentary links the passage with Pompeian painting and the theory of decor. Granger (Loeb) and Rowland–Howe (Cambridge, 1999) set it within the debate over the four Pompeian styles (Mau) and Vitruvius's relation to art criticism; Corso–Romano detail the vocabulary (monstra, tectoria, coliculi). Modern scholarship has debated whether Vitruvius is a reliable observer or a conservative moralist; this edition translates in its own voice and keeps the transmitted text, with no variant affecting the sense.

Editorial note. — This passage (7.5.3–4) is the locus classicus of ancient art criticism. Vitruvius condemns the fanciful wall-painting of the Third Pompeian Style — impossible architectures, hybrid figures, vegetal scrolls — as untruthful. When such Roman decoration was rediscovered underground (in “grottoes”) at

the close of the fifteenth century, it gave rise to the Renaissance ornament known as *grottesche* (whence "grotesque"); Vitruvius's strictures became central to the debate, taken up by Raphael, Daniele Barbaro, and later academic theory.

5. etenim etiam Trallibus cum Apaturius Alabandeus eleganti manu finxisset scaenam in minusculo theatro, quod ἐκκλησιαστήριον apud eos vocitatur, in eaque fecisset columnas signa Centauros sustinentes epistylia, tholorum rotunda tecta, fastigiorum prominentes versuras, coronasque capitibus leoninis ornatas quae ora stillicidiorum e tectis habent rationem, praeterea supra ea nihilominus episcaenum, in qua tholi pronai semifastigia omnisque tecti varius picturis fuerat ornatus, itaque cum aspectus eius scaenae propter asperitatem eblandiretur omnium visus et iam id opus probare fuissent parati,

5. For even at Tralles, when Apaturius of Alabanda had painted with elegant hand the stage of the small theater which they call the *ἐκκλησιαστήριον*, and had set in it columns and statues — Centaurs upholding the architraves, the rounded roofs of domes, the projecting angles of pediments, and cornices ornamented with lions' heads, all of which belong by rights to the eaves of a roof — men were already prepared to approve the work for its charm, when Licymnius the mathematician came forward.

6. tum Licymnius mathematicus prodiit et ait Alabandis satis acutos ad omnes res civiles haberi, sed propter non magnum vitium indecentiae insipientes eos esse iudicatos, quod in gymnasio eorum quae sunt statuae omnes sunt causas agentes, foro discos tenentes aut currentes seu pila ludentes. ita indecens inter locorum proprietates status signorum publice civitati vitium existimationis adiecit. videamus item nunc ne Apaturii scaena efficiat et nos Alabandis aut Abderitas. qui enim vestrum domos supra tegularum tecta potest habere aut columnas seu fastigiorum explicationes? haec enim supra contignationes ponuntur, non supra tegularum tecta. si ergo quae non possunt in veritate rationem habere facti in picturis probaverimus, accedemus et nos his civitatibus quae propter haec vitia insipientes sunt iudicatae.

6. Then Licymnius the mathematician came forward and said: "The Alabandians are reckoned shrewd enough in all civic affairs; yet for one small

fault of impropriety they are held wanting in judgment, for in their gymnasium all the statues are of men pleading causes, while in the forum they hold the discus, or run, or play at ball. Thus the unfitness of the statues to the character of their settings fastened upon the city a public reputation for poor sense. Let us beware, then, lest this scene-painting make us too into Alabandians: for which of you can have, upon the tiled roof of his house, columns or the carved cornices of pediments? Such things rest upon floors, not upon roof-tiles. If, then, we approve in painting what can have no warrant in reality, we join those cities judged wanting in sense."

7. itaque Apaturius contra respondere non est ausus, sed sustulit scaenam et ad rationem veritatis commutatam postea correctam adprobavit. utinam dii inmortales fecissent uti Licymnius revivisceret et corrigeret hanc amentiam tectoriorumque errantia instituta. sed quare vincat veritatem ratio falsa, non erit alienum exponere. quod enim antiqui insumentes laborem et industriam probare contendebant artibus, id nunc coloribus et eorum eleganti specie consecuntur, et quam subtilitas artificis adiciebat operibus auctoritatem, nunc dominicus sumptus efficit ne desideretur.

7. Apaturius therefore dared not reply. He removed the stage painting, revised it in accordance with truth and subsequently secured approval for the corrected work. Would that the immortal gods might bring Licymnius back to life to correct this madness and these misguided practices of wall decoration. It is worth explaining why a false approach prevails over truth. What the ancients sought to commend through art, labor and diligence is now achieved through colors and their elegant appearance. The authority that the craftsman's subtlety once gave to a work is now supplied by the owner's expenditure, so that its absence goes unnoticed.

8. quis enim antiquorum non uti medicamento minio parce videtur usus esse? at nunc passim plerumque toti parietes inducuntur. accedit huc chrysocolla, ostrum, armenium. haec vero cum inducuntur etsi non ab arte sunt posita, fulgentes colorum reddunt visus, et ideo quod pretiosa sunt, legibus excipiuntur, ut ab domino non a redemptore repraesententur.

8. Which of the ancients does not seem to have used minium sparingly, as one would a medicine? Now, by contrast, whole walls are commonly coated with it. Chrysocolla, purple and Armenian blue are added as well. Even when applied

without artistry, these colors give the eye a brilliant impression. Because they are expensive, contracts make a special provision that the owner, rather than the contractor, should supply them.

Critical and interpretative note — VII.5. The sequence from imitation stone panels to cornices, buildings, landscapes, scenes and impossible forms is Vitruvius's rhetorical history of painting, not an automatic archaeological chronology of the Pompeian styles. Veritas and falsitas operate in an architectural and moral context. His objection to reeds supporting roofs or stems bearing figures concerns the intelligibility of construction and nature, not simply a modern opposition between realism and fantasy.

Chapter 6

1. *Quae commonefacere potui ut ab errore discedatur in opere tectorio satis exposui, nunc de apparitionibus ut succurrere potuerit dicam, et primum quoniam de calce initio est dictum, nunc de marmore ponam. Marmor non eodem genere omnibus regionibus procreatur, sed quibusdam locis glaebae ut salis micas perlucidas habentes nascuntur, quae contusae et molitae praestant operibus utilitatem. quibus autem locis eae copiae non sunt, caementa marmorea, sive assulae dicuntur, quae marmorarii ex operibus deiciunt, contunduntur et moluntur, <et cum> est subcretum in operibus utuntur. aliis locis, ut inter Magnesiae et Ephesi fines, sunt loca unde foditur ⟨farina⟩ parata quam nec molere nec cernere opus est, sed sic est subtilis quemadmodum si qua est manu contusa et subcreta.*

2. I have said enough to warn against mistakes in plasterwork. I shall now discuss the materials, beginning with marble, since lime has already been treated. Marble does not occur in the same form in every region. In some places lumps containing translucent particles like grains of salt are found; crushed and ground, they are useful in building. Where such supplies are unavailable, the fragments or chips discarded by marble-workers are crushed, ground and, once sifted, used in the work. Elsewhere, as in the territory between Magnesia and Ephesus, a ready-made powder is quarried. It needs neither grinding nor sifting, being as fine as material crushed and sifted by hand.

Critical note — VII.6. Marble for tectoria may denote powder or aggregate, not solid slabs. Crushing, grinding, sifting, application and polishing remain materially distinct. The supplement ⟨et cum⟩ articulates the sequence of grinding and subsequent sifting; its presence is editorially marked in the Latin even though the English renders the connection naturally.

Chapter 7

1. *Colores vero alii sunt qui per se certis locis procreantur et inde fodiuntur, nonnulli ex aliis rebus tractationibus aut mixtionum temperaturis compositi perficiuntur, uti praestent eandem in operibus utilitatem. primum autem exponemus quae per se nascentia fodiuntur, uti sil, quod graece ὤχρα dicitur. haec vero multis locis ut etiam in Italia invenitur, sed quae fuerat optima, attica ideo nunc non habetur quod Athenis argentifodinae cum habuerunt familias, tunc specus sub terra fodiebantur ad argentum inveniendum. cum ibi vena forte inveniretur, nihilominus uti argentum persequebantur, itaque antiqui egregia copia silis ad politionem operum sunt usi. item rubricae copiosae multis locis eximuntur, sed optimae paucis, uti Ponto Sinope, et Aegypto, in Hispania Balearibus, non minus etiam Lemno, cuius insulae vectigalia Atheniensibus senatus populusque Romanus concessit fruenda. paraetonium vero ex ipsis locis unde foditur habet nomen. eadem ratione melinum, quod eius metallum in sola cycladi Melo dicitur esse.*

2. Some colors occur naturally in particular places and are mined there; others are produced by processing materials or adjusting mixtures to serve the same purpose in building. First I shall describe those extracted in their natural state, such as sil, called ὤχρα in Greek. It is found in many places, including Italy, but the Attic variety, once the best, is no longer available. When the Athenian silver mines employed slave gangs, underground galleries were driven in search of silver. If a vein of ochre was encountered, it was pursued as eagerly as silver, and the ancients consequently had an excellent supply for finishing their buildings. Red ochres are also extracted abundantly in many places, but the finest come from only a few: Sinope in Pontus, Egypt, the Balearic Islands in Hispania and Lemnos, whose revenues the Roman Senate and people granted to the Athenians. Paraetonium takes its name from the place where it is quarried; similarly, melinum is so called because its deposit is said to occur only on Melos in the Cyclades.

4–5. creta viridis item pluribus locis nascitur, sed optima Zmyrnae. hanc autem Graeci θεοδοτεῖον vocant, quod Theodotus nomine fuerat cuius in fundo id genus cretae primum est inventum. auripigmentum, quod ἀρσενικόν graece dicitur, foditur Ponto. sandaraca item pluribus locis, sed optima Ponto proxime flumen Hypanim habet metallum.

4–5. Green earth also occurs in several places, but the best is found at Smyrna. The Greeks call it theodoteion after Theodotus, on whose estate that kind of earth was first discovered. Orpiment, called ἀρσενικόν in Greek, is mined in Pontus. Sandaraca occurs in several places too, but its finest deposit is in Pontus near the river Hypanis.

Critical and material note — VII.7. Sil/ὤχρα, rubrica, paraetonium, melinum, creta viridis, auripigmentum/ἀρσενικόν and sandaraca belong to ancient categories of color, provenance and trade. Modern mineralogical equivalents are not always unique. A probable chemical identification belongs in commentary rather than entering the translation as certainty; sandaraca in particular must not automatically be identified with the later substance called red lead.

Chapter 8

1. *Ingrediar nunc minii rationes explicare. id autem agris Ephesiorum Cilbianis primum esse memoratur inventum, cuius et res et ratio satis magnas habet admirationes. foditur enim glaeba quae dicitur, antequam tractationibus ad minium perveniant, vena uti ferrum, magis subrufo colore, habens circa se rubrum pulverem. cum id foditur, ex plagis ferramentorum crebras emittit lacrimas argenti vivi, quae a fossoribus statim colliguntur.*

2. 1. I shall now explain minium. It is said to have been discovered first in the Cilbian fields belonging to the Ephesians. Both the substance and its treatment are remarkable. Before processing yields minium, the material is extracted as a lump from a vein resembling iron ore, but more reddish in color and surrounded by red dust. When it is mined, the blows of the tools release frequent drops of quicksilver, which the miners immediately collect.

2. hae glaebae cum collectae sunt, in officina propter umoris plenitatem coiciuntur in fornacem ut interarescant, et is qui ex his ab ignis vapore fumus suscitatur cum resedit in solum furni, invenitur esse argentum vivum. exemptis glaebis guttae eae quae residebunt propter brevitates non possunt colligi, sed in vas aquae converruntur et ibi inter se congruunt et una confunduntur. id autem cum sint quattuor sextariorum, mensurae cum expenduntur, invenientur esse pondo centum.

2. Because these lumps contain much moisture, they are taken to the workshop and put into a furnace to dry. The fumes raised by the heat of the fire, when deposited on the furnace floor, prove to be quicksilver. After the lumps have been removed, the remaining droplets are too small to gather individually. They are swept into a vessel of water, where they unite into a single mass. When the quantity reaches four sextarii, it will be found on weighing to amount to one hundred pounds.

3. cum in aliquo vase est confusum, si supra id lapideum centenarium pondus inponatur, natat in summo neque eum liquorem potest onere suo premere nec elidere nec dissipare. centenario sublato si ibi auri scripulum inponatur, non natabit sed ad imum per se deprimetur. ita non amplitudine ponderis sed genere singularum rerum gravitatem esse non est negandum.

3. When a liquid is mixed in a vessel, if a hundred-year-old stone weight is placed on top of it, it floats on top and cannot press down on the liquid with its own weight, nor can it remove or dissipate it. If a gold coin is placed there after the hundred-year-old stone weight is removed, it will not float but will sink to the bottom by itself. Thus it cannot be denied that gravity is not due to the magnitude of the weight but to the nature of individual things.

4. id autem multis rebus est ad usum expeditum. neque enim argentum neque aes sine eo potest recte inaurari. cumque in veste intextum est aurum eaque vestis contrita propter vetustatem usum non habeat honestum, panni in fictilibus vasis inpositi supra ignem comburuntur. is cinis coicitur in aquam, et additur eo argentum vivum. id autem omnes micas auri corripit in se et cogit secum coire. aqua defusa cum id in pannum infunditur et ibi manibus premitur, argentum per panni raritates propter liquorem extra labitur, compressione coactum aurum intra purum invenitur.

4. But this is for many things for ready use. For neither silver nor brass can be properly gilded without it. When gold is woven into a garment, and that garment, worn out because of its age, is no longer fit for honest use, the cloths are placed in earthenware vessels and burned over a fire. The ashes are thrown into water, and quicksilver is added to it. This, however, seizes all the gold flakes in itself and forces them to coalesce. When the water is poured into the cloth and pressed there with the hands, the silver slides out through the rarefied nature of the cloth because of the liquid, while the gold, forced inside by compression, is found pure.

Editorial note. — Vitruvius's *minium* is true vermilion (cinnabar, mercuric sulphide), not the red lead with which the word was later confused. This chapter (VII.8) gives the earliest detailed account of mining cinnabar and of distilling *argentum vivum* (quicksilver, mercury) from it, together with the use of mercury to recover gold from worn cloth-of-gold by amalgamation — a technique still employed in later metallurgy.

Critical and metrological note — VII.8. Minium and argentum vivum retain their ancient names before a modern identification is offered. Heating, condensation, crushing and washing are treated as historical procedures. Libra, centenarium, scripulum and sextarius remain visible as ancient units; any modern conversion is approximate and requires its metrological basis.

Chapter 9

1. *Revertar nunc ad minii temperaturam. ipsae enim glaebae cum sunt aridae, contunduntur pilis ferreis, et lotionibus et cocturis crebris relictis stercoribus efficiuntur ut adveniant colores. cum ergo emissae sint ex minio per argenti vivi relictionem quas in se naturales habuerat virtutes, efficitur tenera natura et viribus inbecillis.*

2. 1. I return now to the preparation of minium. Once dry, the lumps are crushed with iron pestles. Repeated washing and heating remove the impurities and bring out the color. When the separation of the quicksilver has deprived the minium of its inherent properties, however, it becomes delicate and weak.

2. itaque cum est in expolitionibus conclavium tectis inductum, permanet sine vitiis suo colore. apertis vero id est peristyliis aut exhedris aut ceteris eiusdem modi locis, quo sol et luna possit splendores et radios inmittere, cum ab his locus tangitur, vitiatur et amissa virtute coloris denigratur. itaque cum et alii multi tum etiam Faberius scriba cum in Aventino voluisset habere domum eleganter expolitam, peristyliis parietes omnes induxit minio, qui post dies XXX facti sunt invenusto varioque colore. itaque primo locavit inducendos alios colores.

2. Applied to the finished plaster of covered rooms, it therefore retains its color without deterioration. In open places, such as peristyles, exedrae and similar spaces, where sunlight and moonlight can reach it, exposure causes it to deteriorate and blacken as its color loses its strength. Among many others, Faberius the scribe, wishing to finish his house on the Aventine elegantly, coated all the walls of its peristyles with minium. Within thirty days they had become discoloured and uneven, and he promptly contracted for other colors to be applied over them.

3. at si qui subtilior fuerit et voluerit expolitionem miniaceam suum colorem retinere, cum paries expolitus et aridus fuerit, ceram ponticam igni liquefactam paulo oleo temperatam saeta inducat, deinde postea carbonibus in ferreo vase compositis eam ceram una cum pariete calfaciundo sudare cogat, atque ut peraequetur deinde tunc candela centunculisque puris subigat, uti signa marmorea nuda curantur. haec autem γάνωσις graece dicitur.

3. A more discerning owner who wishes a minium finish to retain its color should, once the wall is polished and dry, brush it with Pontic wax melted over

a fire and mixed with a little oil. Then place coals in an iron vessel and heat the wax together with the wall, causing it to sweat and spread evenly. Finally work it with a wax taper and clean linen, as bare marble statues are treated. This process is called γάνωσις in Greek.

Explanatory note — Bk. 7.8–7.9 (minium, quicksilver, and ganosis). Vitruvius describes minium, which for him is cinnabar (mercuric sulphide, the ancient vermilion), not the red lead (minium secundarium) with which the name was later confused. He calls the clod from which it is drawn anthrax; he explains its working —drying, grinding, washing, and heating to bring out the color— and its source (the Spanish deposits of Sisapo, alongside Ephesus). From cinnabar comes hydrargyrum or argentum vivum, 'quicksilver,' which he describes as gathered in 'tears' and used to recover gold by amalgam. He warns that vermilion is unstable in light: exposed to the sun it blackens. Hence ganosis (7.9): over the dry color, Punic wax melted with a little oil is applied, warmed with coals, and polished with a cloth, sealing the surface as was done with the marble of statues. It is a key chapter for the history of painting technique and of ancient toxicology (mercury is poisonous). The text has been collated with no variant affecting the sense.

Comparative note — Bk. 7.8–7.9 (minium and quicksilver). In the Budé, Book VII is the work of Bernard Liou, Michel Zuinghedau, and Marie-Thérèse Cam (1995), whose commentary collates the passage with Theophrastus (De lapidibus 58), Pliny (Natural History 33.37–40), and Dioscorides (5.94). Granger (Loeb) and Rowland–Howe (Cambridge, 1999) stress the distinction, crucial for archaeometry, between Vitruvius's cinnabar (HgS) and red lead; Corso–Romano fix the vocabulary (anthrax, hydrargyrum, ganosis). Modern physico-chemical analysis of Pompeian frescoes confirms both the use of cinnabar and its photochemical darkening —precisely the problem ganosis sought to prevent. This edition keeps the transmitted text and translates in its own voice, with no variant affecting the sense.

4. ita obstans cerae ponticae lorica non patitur nec lunae splendorem nec solis radios lambendo eripere ex his politionibus colorem. quae autem in Ephesiorum metallis fuerunt officinae, nunc traiectae sunt ideo Romam quod id genus venae postea est inventum Hispaniae regionibus, e quibus metallis glaebae portantur et

per publicanos Romae curantur. eae autem officinae sunt inter aedem Florae et Quirini.

4. Thus the breastplate of Pontic wax, standing firm, does not suffer either the brilliance of the moon or the rays of the sun to lick away the color from these polishes. But the workshops which were in the metals of the Ephesians have now been transferred to Rome, because that kind of vein was later discovered in the regions of Spain, from which metals the slabs are brought and treated by the publicans in Rome. Now those workshops are between the temple of Flora and Quirinus.

5. Vitiatur minium admixta calce. itaque si qui velit experiri id sine vitio esse, sic erit faciendum. ferrea lamna sumatur, eo minium inponatur, ad ignem conlocetur donec lamna candescat. cum e candore color mutatus fuerit eritque ater, tollatur lamna ab igni et sic refrigeratum si restituatur in pristinum colorem, sine vitio esse probabitur, sin autem permanserit nigro colore, significabit se esse vitiatum.

5. Let the minium be tainted with lime. Therefore, if anyone wishes to test whether it is without taint, this is what must be done. Take an iron plate, put the minium on it, and place it over the fire until the plate becomes red-hot. When the color has changed from whiteness and become black, remove the plate from the fire and, having cooled it, if it is restored to its original color, it will be proven to be without taint, but if it remains black, it will indicate that it is tainted.

6. Quae succurrere potuerunt mihi de minio dixi. chrysocolla adportatur a Macedonia, foditur autem ex îs locis qui sunt proximi aerariis metallis. armenium et indicum nominibus ipsis indicatur quibus in locis procreatur.

6. I have spoken of those things which could have helped me concerning minium. Chrysocolla is brought from Macedonia, and is mined from those places which are nearest to the precious metals. Armenian and indigo are indicated by the very names in which they are produced.

Critical and technical note — VII.9. Light-induced alteration, wax-and-oil protection and the thermal test for adulteration remain procedures attributed to Vitruvius. The modern correlation of minium here with cinnabar or mercuric sulphide belongs in commentary. The wax reading in the adopted Latin and its English rendering must be distinguished from alternative

nomenclature; the technical reconstruction does not independently determine the transmitted word.

Chapter 10

1. *Ingrediar nunc ad ea quae ex aliis generibus tractationum temperaturis commutata recipiunt colorum proprietates, et primum exponam de atramento, cuius usus in operibus magnas habet necessitates, ut sint notae quemadmodum praeparentur certis rationibus artificiorum ad id temperaturae.*

2. I will now proceed to those things which receive the properties of colors when changed by other types of treatment temperatures, and I will first explain about ink, the use of which in works has great needs, so that it may be known how it is prepared by certain methods of artificers at that temperature.

2. namque aedificatur locus uti laconicum et expolitur marmore subtiliter et levigatur. ante id fit fornacula habens in laconicum nares, et eius praefurnium magna diligentia comprimitur ne flamma extra dissipetur. in fornace resina conlocatur. hanc autem ignis potestas urendo cogit emittere per nares intra laconicum fuliginem, quae circa parietem et camerae curvaturam adhaerescit. inde collecta partim componitur ex gummi subacta ad usum atramenti librarii, reliquum tectores glutinum admiscentes in parietibus utuntur.

2. Build a room like a Laconian hot room, finish its interior with fine marble plaster, and polish it smooth. In front of it, construct a small furnace with vents opening into the room, and seal the firing chamber carefully so that the flame cannot escape outside. Place resin in the furnace. As it burns, the fire drives soot through the vents into the room, where it adheres to the walls and the curved vault. Collect this soot: work part of it with gum to make writing ink; plasterers mix the remainder with glue for use on walls.

3. Si autem hae copiae non fuerint paratae, ita necessitatibus erit administrandum, ne expectatione morae res retineatur. sarmenta aut taedae schidiae comburantur, cum erunt carbones extinguantur, deinde in mortario cum glutino terantur.

3. But if these supplies are not ready, then the necessities must be managed in this way, so that the matter is not held up by the expectation of delay. The twigs or splinters of firewood are burned, when the coals are extinguished, they are then ground in a mortar with glue.

4. ita erit atramentum tectoribus non invenustum. non minus si faex vini arefacta et cocta in fornace fuerit et ea contrita cum glutino in opere inducetur, atramenti suavitatis superque efficiet colorem, et quo magis ex meliore vino parabitur, non modo atramenti sed etiam indici colorem dabit imitari.

4. Thus the ink will be not unattractive to the painters. No less so if the dregs of wine have been dried and cooked in a furnace and this crushed together with the glue are introduced into the work, on which it will produce a color of the sweetness of the ink, and the more it is prepared from the best wine, it will imitate not only the color of the ink but also of the indicator.

Critical note — VII.10. Atramentum includes blacks obtained by different processes: soot from resin, charcoal from vine shoots or resinous timber, and calcined wine lees. Lacus, laconicum, fornacula, nares and glutinum are interpreted within the manufacturing apparatus. The similarity to indicum mentioned by Vitruvius concerns color and does not prove identity of material.

Chapter 11

1. *Caeruli temperationes Alexandriae primum sunt inventae, postea item Vestorius Puteolis instituit faciundum. ratio autem eius e quibus est inventa satis habet admirationis. harena enim cum nitri flore conteritur adeo subtiliter ut efficiatur quemadmodum farina, ea aes cyprum limis crassis uti scobis facta mixta conspargitur ut conglomeretur. deinde pilae manibus versando efficiuntur et ita conligantur ut inarescant. aridae componuntur in urceo fictili, urcei in fornace. ita aes et ea harena ab ignis vehementia confervescendo cum coaluerint, inter se dando et accipiendo sudores a proprietatibus discedunt suisque viribus per ignis vehementiam confectis caeruleo rediguntur colore.*

2. Blue (*caeruleum*) was first compounded at Alexandria, and afterwards Vestorius set up its manufacture at Puteoli. The method of its discovery is well worth admiration. Sand is ground together with flowers of natron so finely that it becomes as it were flour; copper is filed with coarse files into shavings and sprinkled over it; the mixture is moistened, rolled by hand into balls, dried, and packed in an earthen jar, and the jars are placed in a furnace. So, when the copper and the sand grow incandescent together by the fierceness of the fire, by giving and receiving their properties from one another they take on a blue color.

Explanatory note — Bk. 7.11 (Egyptian blue, caeruleum). Vitruvius transmits the only ancient recipe for the first synthetic pigment in history: caeruleum or Egyptian blue (from caelum, 'sky'; hence 'cerulean'). Its formula was invented at Alexandria and then established at Puteoli by Vestorius —a Puteolan banker, correspondent of Cicero and Atticus—, whence the 'caeruleum Vestorianum.' The recipe: sand (harena) is ground with flower of natron until it is as fine as flour; filings of Cyprian copper are sprinkled in; balls are rolled by hand, dried, and fired in earthenware jars in a furnace, until copper and sand, fused by the fire, take on the blue color. Modern chemistry identifies the product as a calcium copper silicate (cuprorivaite, $CaCuSi_4O_{10}$), sintered at about 850–1000 °C; the calcium comes from the sand itself, which Vitruvius does not mention. The text has been collated with no variant affecting the sense.

Comparative note — Bk. 7.11 (Egyptian blue). The Budé of Liou, Zuinghedau, and Cam (1995) comments on the recipe in the light of the pigment's archaeometry; Granger (Loeb) and Rowland–Howe (Cambridge, 1999) stress that it is the only ancient textual source on its manufacture. Corso–

Romano fix the terms (harena, nitri flos, aes cyprium). Verification is today experimental: laboratory trials reproduce Egyptian blue by sintering siliceous sand, an alkaline flux, and a copper compound at 850–1000 °C, confirming the Vitruvian procedure —though the text omits quantities and temperatures. This edition translates in its own voice and keeps the transmitted text, with no variant affecting the sense.

3. *Editorial note.* — The *caeruleum* here described is Egyptian blue (calcium copper silicate), the earliest synthetic pigment known, manufactured since the third millennium BC. Vitruvius gives the recipe — silica, a copper compound, and an alkaline flux fired together — that modern analysis has confirmed; its production at Puteoli by Vestorius gave it the name caeruleum Vestorianum.

2. usta vero, quae satis habet utilitatis in operibus tectoriis, sic temperatur. glaeba silis boni coquitur ut sit in igni candens. ea autem aceto extinguitur et efficitur purpureo colore.

2. But the burnt clay, which is quite useful in roofing works, is tempered in this way. A lump of good clay is cooked until it is glowing in the fire. Then it is extinguished with vinegar and becomes purple in color.

Critical and material note — VII.11. Caeruleum remains an ancient technical name. The recipe involving sand, nitri flos, copper filings and firing can be compared archaeometrically with Egyptian blue, but that modern identification belongs in the note. Usta is treated separately as a pigment produced by heating sil and quenching it with vinegar.

Chapter 12

1. *De cerussa aerugineque quam nostri aerucam vocitant non est alienum quemadmodum comparetur dicere. Rhodo enim doliis sarmenta conlocantes aceto suffuso supra sarmenta conlocant plumbeas massas, deinde ea operculis obturant ne spiramento obturatum emittatur. post certum tempus aperientes inveniunt e massis plumbeis cerussam. eadem ratione lamellas aereas conlocantes efficiunt aeruginem quae aeruca appellatur.*

2. Of the lead rust which our people call aeruca, it is not strange to say how it is compared. For in Rhodes, placing vine shoots in barrels, they place lead masses on top of the vine shoots, suffused with vinegar, then close them with lids so that the air cannot escape. After a certain time, opening them, they find lead from the lead masses. In the same way, placing bronze plates, they produce a rust which is called aeruca.

2. cerussa vero cum in fornace coquitur, mutato colore ad ignem [incendi] efficitur sandaraca. id autem incendio facto ex casu didicerunt homines, et ea multo meliorem usum praestat quam quae de metallis per se nata foditur.

White lead (cerussa), when baked in a kiln, changes color in the fire and turns into sandarach (red lead). Men learned this by chance, from a fire, and this pigment renders far better service than the one extracted by digging, born of its own accord in the veins.

Critical note — VII.12. Cerussa, aeruca and sandaraca do not map invariably onto single modern substances. White lead prepared from lead and vinegar fumes is distinguished from the copper-associated aeruca, and sandaraca made by heating cerussa from the mineral sandaraca mentioned elsewhere. Translation should preserve those differences rather than harmonize the names.

Chapter 13

1. *Incipiam nunc de ostro dicere, quod et carissimam et excellentissimam habet praeter hos colores aspectus suavitatem. id autem excipitur e conchylio marino, e quo purpura efficitur, cuius non minores sunt quam ceterarum <rerum> naturae considerantibus admirationes, quod habet non in omnibus locis quibus nascitur unius generis colorem, sed solis cursu naturaliter temperatur.*

2. I shall now speak of sea-purple (*ostrum*), which, beyond all the other colors, has the costliest and most exquisite loveliness of aspect. It is obtained from a marine shellfish, from which the purple dye is made, and to the observer its nature holds wonders not less than those of any other thing; for it does not yield a color of one kind in all the places where it is gathered, but is tempered by the course of the sun.

3. *Editorial note.* — The *ostrum* of this chapter is Tyrian sea-purple, extracted from the murex and kindred shellfish. Vitruvius's observation that its hue varies with latitude — blackish in the north (Pontus, Gaul), violet at the equinoctial line, red in the south — reflects real differences among Mediterranean murex species and dye-recipes; the dye was the most precious of antiquity, reserved by sumptuary law for the highest rank.

2. itaque quod legitur Ponto et Gallia, quod hae regiones sunt proximae ad septentrionem, est atrum. progredientibus inter septentrionem et occidentem invenitur lividum. quod autem legitur ad aequinoctialem orientem et occidentem, invenitur violaceo colore. quod vero meridianis regionibus excipitur, rubra procreatur potestate, et ideo hoc Rhodo etiam insula creatur ceterisque eiusmodi regionibus quae proximae sunt solis cursui.

2. Therefore, what is read as Pontus and Gaul, because these regions are closest to the north, is black. As we proceed between the north and the west, it is found to be livid. But what is read as east and west of the equinoctial line is found to be of a violet color. But what is taken up in the southern regions is produced by red power, and therefore this island of Rhodes is also created and other such regions which are closest to the course of the sun.

3. ea conchylia cum sunt lecta, ferramentis circa scinduntur, e quibus plagis purpurea sanies uti lacrima profluens excussa in mortariis terendo comparatur, et quod ex concharum marinarum testis eximitur, ideo ostrum est vocitatum. id autem propter salsuginem cito fit siticulosum, nisi mel habeat circa fusum.

3. When these shells are picked, they are split open with tools, from which wounds a purple sap, like a tear, is obtained by grinding them in mortars, and the testicle taken from the seashells is therefore called oyster. But because of its saltiness it quickly becomes dry, unless it has honey mixed in it.

Critical note — VII.13. Ostrum can refer to the dye-producing material, the mollusc or the color. Retaining the ancient term beside 'purple' helps preserve this range. The supplement ⟨rerum⟩ remains editorially visible. The geographical variation of color belongs to Vitruvius's natural history, not a modern biological taxonomy.

Chapter 14

1. *Fiunt etiam purpurei colores infecta creta rubiae radice et hysgino, non minus et ex floribus alii colores. itaque tectores cum volunt sil atticum imitari, violam aridam coicientes in vas cum aqua, confervefaciunt ad ignem, deinde cum est temperatum coiciunt in linteum, et inde manibus exprimentes recipiunt in mortarium aquam ex violis coloratam, et eo cretam infundentes et eam terentes efficiunt silis attici colorem.*

2. Purple colors are made by infusing chalk with ruby root and hyssop, and no less other colors are made from flowers. Therefore, when painters wish to imitate Attic sil, they put dry violets in a vessel with water, heat them over the fire, then when it is lukewarm they pour them onto a cloth, and from there, squeezing them with their hands, they take the water colored from the violets into a mortar, and pouring chalk into it and grinding it, they produce the color of Attic sil.

2. eadem ratione vaccinium temperantes et lacte miscentes purpuram faciunt elegantem. item qui non possunt chrysocolla propter caritatem uti, herba quae luteum appellatur caeruleum inficiunt, et <> utuntur viridissimum colorem. haec autem infectiva appellatur. item propter inopiam coloris indici cretam selinusiam aut anulariam vitro, quod Graeci ἰσάτιν appellant, inficientes, imitationem faciunt indici coloris.

2. In the same way, those who temper cranberries and mix them with milk make an elegant purple. Likewise, those who cannot use chrysocolla because of charity, infuse the herb called yellow with blue, and <thus> use a very green color. This is called infective. Likewise, because of the lack of the color of the indicator, infusing selinous or annular chalk with glass, which the Greeks call ἴσατιν, they make an imitation of the color of the indicator.

3. Quibus rationibus et rebus ad dispositionem firmitates <> quibusque decoras oporteat fieri picturas, item quas habeant omnes colores in se potestates, ut mihi succurrere potuit in hoc libro perscripsi. itaque omnes aedificationum perfectiones quam habere debeant opportunitatem ratiocinationis, septem voluminibus sunt finitae, insequenti autem de aqua, si quibus locis non fuerit, quemadmodum inveniatur et qua ratione ducatur quibusque rebus si erit salubris et idonea probetur explicabo.

3. By what means and things the firmness of refinements is reached, and by what means beautiful pictures should be made, and likewise what powers all colors have in themselves, as could be of assistance to me, I have written down in this book. Therefore all the perfections of buildings, which they should have the opportunity of reasoning, are finished in seven volumes, but in the following I will explain about water, if in what places it is not, how it is found and by what means it is drawn, and for what purposes it will be proved wholesome and suitable.

Argumentum Libri VIII — *On water: the search for springs, the properties of different waters, the qualities of famous rivers and fountains, the methods of conveyance by channels, lead and clay pipes, and leveling by means of instruments.*

Notice. *— Book VIII is devoted to water. Its preface argues, with the natural philosophers, that water is the first principle of all things; the book then treats the finding of springs, the qualities of different waters and famous rivers, the leveling of conduits with the chorobates, and conduction by masonry channels, lead pipes and earthenware tubes — with the prescient warning against the harm of lead. It is a foundational text in the history of hydraulic engineering and public health.*

Critical note — VII.14. Substitution colors made from rubia, hysginum, violets, vaccinium, luteum and other materials reveal an economy of architectural finishing. Ancient plant names remain where botanical identification is uncertain. The supplement ⟨ita⟩ is marked, and the historical practice of imitation is distinguished from a modern legal or commercial category of forgery.

M. VITRVVIVS POLLIO · DE ARCHITECTVRA · LIBER VIII

Preface

[1] De septem sapientibus Thales Milesius omnium rerum principium aquam est professus, Heraclitus ignem, Magorum sacerdotes aquam et ignem, Euripides, auditor Anaxagorae, quem philosophum Athenienses scaenicum appellaverunt, aera et terram, eamque e caelestium imbrium conceptionibus inseminatam fetus gentium et omnium animalium in mundo procreavisse, et quae ex ea essent prognata, cum dissolverentur temporum necessitate coacta in eandem redire, quaeque de aere nascerentur, item in caeli regiones reverti neque interitiones recipere et dissolutione mutata in eam recidere, in qua ante fuerant, proprietatem. Pythagoras vero, Empedocles, Epicharmos aliique physici et philosophi haec principia esse quattuor proposuerunt: aerem, ignem, terram, aquam, eorumque inter se cohaerentiam naturali figuratione e generum discriminibus efficere qualitates.

Among the Seven Sages, Thales of Miletus held that water was the first principle of all things; Heraclitus favored fire, and the priests of the Magi both water and fire. Euripides, a pupil of Anaxagoras whom the Athenians called "the philosopher of the stage", proposed air and earth: the latter, fertilised by rain from the heavens, brought forth human beings and other living creatures. What arose from earth would return to it when dissolved by time, while what arose from air would return to the regions of the sky, not perishing but reverting through dissolution to its former nature. Pythagoras, Empedocles, Epicharmus and other natural philosophers proposed four principles — air, fire, earth and water — whose natural combination produces different qualities.

[2] Animadvertimus vero non solum nascentia ex his esse procreata, sed etiam res omnes non ali sine eorum potestate neque crescere nec tueri. Namque corpora sine spiritus redundantia non possunt habere vitam, nisi aer influens cum incremento fecerit auctus et remissiones continenter. Caloris vero si non fuerit in corpore iusta comparatio, non erit spiritus animalis neque erectio firma, cibique vires non poterunt habere coctionis temperaturam. Item si non terrestri cibo membra corporis alantur, deficient et ita a terreni principii mixtione erunt deserta.

We observe that the elements not only produce living things: without their power nothing can be nourished, grow or be sustained. Bodies cannot live without a sufficient supply of breath, as incoming air maintains the continual expansion and contraction of breathing. Unless the body has the proper measure of heat, it lacks vitality and strength, and food cannot be digested at the necessary temperature. Unless its members are nourished by food from the earth, they fail, deprived of the contribution of the earthly element.

3. Animalia vero si fuerint sine umoris potestate, exsanguinata et exsucata [a principiorum liquore] interarescent. Igitur divina mens, quae proprie necessaria essent gentibus, non constituit difficilia et cara, uti sunt margaritae, aurum, argentum ceteraque, quae neque corpus nec natura desiderat, sed sine quibus mortalium vita non potest esse tuta, effudit ad manum parata per omnem mundum. Itaque ex his, si quid forte defit in corpore spiritus, ad restituendum aer adsignatus id praestat. Apparatus autem ad auxilia caloris solis impetus et ignis inventus tutiorem efficit vitam. Item terrenus fructus escarum praestans copiis supervacuis desiderationibus alit et nutrit animales pascendo continenter. Aqua vero non solum potus sed infinitas usu praebendo necessitates, gratas, quod est gratuita, praestat utilitates.

Animals deprived of moisture would likewise lose their blood and bodily fluids and dry up. The divine mind therefore did not make the necessities of human life difficult and costly to obtain, as are pearls, gold, silver and other things that neither the body nor nature requires. Instead, it made readily available throughout the world the things without which mortal life cannot be sustained. If the body lacks breath, air restores it. The warmth of the Sun and the use of fire provide the heat that makes life more secure. The produce of the earth supplies abundant food, continually feeding and sustaining living creatures. Water provides not only drink but countless other necessities, and its usefulness is all the more welcome because it is freely available.

[4] Ex eo etiam qui sacerdotia gerunt moribus Aegyptiorum, ostendunt omnes res e liquoris potestate consistere. Itaque cum hydria aqua ad templum aedemque casta religione refertur, tunc in terra procumbentes manibus ad caelum sublatis inventionis gratias agunt divinae benignitati.

Those who hold priestly office according to Egyptian custom likewise show that all things depend on the power of water. When water is brought in a hydria to a

temple or sanctuary with due reverence, they prostrate themselves on the ground and raise their hands to heaven, giving thanks to divine beneficence for its discovery.

Cum ergo et a physicis et philosophis et ab sacerdotibus iudicetur ex potestate aquae omnes res constare, putavi, quoniam in prioribus septem voluminibus rationes aedificiorum sunt expositae, in hoc oportere de inventionibus aquae, quasque habeat in locorum proprietatibus virtutes, quibusque rationibus ducatur, et quemadmodum ante probetur, scribere.

Since natural philosophers, philosophers and priests all hold that everything depends on the power of water, and since the preceding seven books have set out the principles of building, I have decided to devote this book to finding water, to the qualities it acquires in different places, to the methods of conveying it and to the tests by which it is assessed.

Therefore, since both physicists and philosophers and priests judge that all things are evident by the force of water, I thought that, as in the seven previous volumes the accounts of buildings were set forth, in this one it was necessary to deal with the discoveries of water, and the virtues it has in the properties of places, and by what accounts it is led, and how, before being tested, to write.

Critical note — VIII, preface. The accounts of Thales, Heraclitus, the Magian priests, Euripides and Anaxagoras, and Egyptian tradition form an ancient philosophical frame for the discussion of water. Attributed doctrine, the history of philosophy and modern physical explanation are kept separate, without retrospectively harmonizing Vitruvius's doxography.

Chapter 1

[1] Est enim maxime necessaria et ad vitam et ad delectationes, et ad usum cotidianum Ea autem erit facilior, si erunt fontes aperti et fluentes. Sin autem non profluent, quaerenda sub terra sunt capita et colligenda. Quae sic erunt experienda, uti procumbatur in dentes, antequam sol exortus fuerit, in locis, quibus erit quaerendum, et in terra mento conlocato et fulto prospiciantur eae regiones; sic enim non errabit excelsius quam oporteat visus, cum erit inmotum mentum, sed libratam altitudinem in regionibus certa finitione designabit. Tunc, in quibus locis videbuntur umores concrispantes et in aera surgentes, ibi fodiatur; non enim in sicco loco hoc potest signum fieri.

[1] For water is most necessary both for life and for its pleasures, and for daily use. It will be the easier to obtain if there are open and flowing springs. But where none flow forth, the sources must be sought and gathered underground. The search is to be made thus: let a man lie face downward, before the sun has risen, in the places in which it is to be sought, and with the chin placed and supported on the ground, those regions are to be looked for; for in this way the sight will not err higher than it should be, when the chin is motionless, but will designate a balanced height in the regions with a certain boundary. Then, in those places where moistures are seen to be bubbling and rising into the air, there is to be dug; for this sign cannot be made in a dry place.

[2] Item animadvertendum est quaerentibus aquam, quo genere sint loca; certa enim sunt, in quibus nascitur. In creta tenuis et exilis et non alta est copia; ea erit non optimo sapore. Item sabulone soluto tenuis, sed inferioris loci invenietur; ea erit limosa et insuavis. Terra autem nigra sudores et stillae exiles inveniuntur, quae ex hibernis tempestatibus collectae in spissis et solidis locis subsidunt; haec habent optimum saporem. Glarea vero mediocres et non certae venae reperiuntur; hae quoque sunt egregia suavitate. Item sabulone masculo harenaque carbunculo certiores [et stabiliores] sunt copiae; eaeque sunt bono sapore. Rubro saxo et bonae et copiosae, si non per intervenia dilabantur et liquescant. Sub radicibus autem montium et in saxis silicibus uberiores et affluentiores; eaeque frigidiores sunt et salubriores. Campestribus autem fontibus salsae, graves, tepidae, non suaves, nisi quae ex montibus sub terra submanantes erumpunt in medios campos ibique arborum umbris contectae praestant montanorum fontium suavitatem.

Those searching for water should also examine the nature of the ground, since different kinds occur in particular formations. In clay the supply is slight, shallow and poor in taste. In loose sand it is likewise scanty, though found at a greater depth, and it is muddy and unpleasant. In black earth, small seepages and droplets collect from winter rain and settle in dense, compact ground; these have an excellent taste. Gravel contains moderate and uncertain veins, also of excellent sweetness. In coarse sand and carbunculus, supplies are more reliable [and more constant], and their taste is good. In red rock the supply is abundant and good, provided that it does not escape and disperse through intervening fissures. Beneath mountain slopes and in siliceous rock it is more plentiful, colder and more wholesome. Springs in the plains, by contrast, are saline, heavy, lukewarm and unpleasant, except where water runs underground from the mountains and emerges in the middle of a plain: shaded there by trees, it retains the sweetness of mountain springs.

[3] Signa autem, quibus terrarum generibus supra scriptum est, ea invenientur nascentia: tenuis iuncus, salix erratica, alnus, vitex, harundo, hedera aliaque, quae eiusmodi sunt, quae non possunt nasci per se sine umore. Solent autem eadem in lacunis nata esse, quae sidentes praeter reliquum agrum excipiunt ex imbribus et agris per hiemem propterque capacitatem diutius conservant umorem. Quibus non est credendum, sed quibus regionibus et terris, non lacunis, ea signa nascuntur, non sata, sed naturaliter per se procreata, ibi est quaerenda.

[3] The signs, which are written above, will be found growing in the following types of land: the slender rush, the wandering willow, the alder, the vitex, the reed, the ivy, and other such plants, which cannot grow by themselves without moisture. But they are usually grown in lakes, which, when they sit in them, receive more moisture from the rains and fields than from the rest of the land, and because of their capacity, they retain moisture longer during the winter. We must not believe these, but we must seek in which regions and lands, not lakes, these signs grow, not sown, but naturally produced by themselves.

[4] In quibus si eae significabuntur inventiones, sic erunt experiundae. Fodiatur quoquoversus locus latus ne minus pedes <tres, altus pedes> quinque, in eoque conlocetur circiter solis occasum scaphium aereum aut plumbeum aut pelvis. Ex his quod erit paratum, id intrinsecus oleo ungatur ponaturque inversum, et

summa fossura operiatur harundinibus aut fronde, supra terra obruatur; tum postero die aperiatur, et si in vaso stillae sudoresque erunt, is locus habebit aquam.

Where these signs indicate water, test the ground as follows. Dig a pit at least three feet across in each direction and five feet deep. At about sunset place in it a bronze or lead vessel, or a basin, whichever is available, first coating its inner surface with oil and setting it upside down. Cover the opening of the pit with reeds or leaves and lay earth over them. Open it the following day: if droplets of condensation appear in the vessel, the place contains water.

[5] Item si vasum ex creta factum non coctum in ea fossione eadem ratione opertum positum fuerit, si is locus aquam habuerit, cum apertum fuerit, vas umidum erit et iam dissolvetur ab umore. Vellusque lanae si conlocatum erit in ea fossura, insequenti autem die de eo aqua expressa erit, significabit eum locum habere copiam. Non minus si lucerna concinnata oleique plena et accensa in eo loco operta fuerit conlocata et postero die non erit exusta, sed habuerit reliquias olei et enlychnii ipsaque umida invenietur, indicabit eum locum habere aquam, ideo quod omnis tepor ad se ducit umores. Item in eo loco ignis factus si fuerit et percalefacta terra et adusta vaporem nebulosum ex se suscitaverit, is locus habebit aquam.

An unfired clay vessel placed in the pit and covered in the same way will, if water is present, be found damp and beginning to disintegrate. A fleece of wool from which water can be squeezed the following day likewise indicates an abundant supply. A lamp, prepared with oil and lit before being enclosed there, will indicate water if it has not burnt out by the next day, still contains oil and wick, and is found damp: warmth attracts moisture. Similarly, if a fire lit there heats the earth and causes a misty vapor to rise, water is present.

[6] Cum haec ita erunt pertemptata et, qua supra scripta sunt, signa inventa, tum deprimendus est puteus in eo loco, et si erit caput aquae inventum, plures circa sunt fodiendi et per specus in unum locum omnes conducendi.

Once these tests have been made and the signs described above have been found, sink a well at that place. If a source of water is discovered, dig several more wells around it and connect them by underground galleries so that the water gathers at a single point.

Haec autem maxime in montibus et regionibus septentrionalibus sunt quaerenda, eo quod in his et suaviora et salubriora et copiosiora inveniuntur.

Aversi enim sunt solis cursui, et in his locis primum crebrae sunt arbores et silvosae, ipsique montes suas habent umbras obstantes et radii solis non directi perveniunt ad terram nec possunt.

These are to be sought especially in the mountains and northern regions, because in these they are found both sweeter, more wholesome, and more abundant. For they are turned away from the course of the sun, and in these places trees and woods are first abundant, and the mountains themselves have their shadows that block them, and the rays of the sun do not reach the earth directly, nor can they burn the moisture.

These, however, should be sought mainly in the mountains and northern regions, because there they are sweeter, healthier, and more abundant. For they are contrary to the course of the sun, and in these places trees and forests abound first, and the mountains themselves have their shadows, and the sun's rays are not directed towards the earth and cannot scorch the moisture.

[7] Intervallaque montium maxime recipiunt imbres et propter silvarum crebritatem nives ab umbris arborum et montium ibi diutius conservantur, deinde liquatae per terrae venas percolantur et ita perveniunt ad infimas montium radices, ex quibus profluentes fontium erumpunt ructus. Campestribus autem locis contrario non possunt habere copias. Nam quaecumque sunt, non possunt habere salubritatem, quod solis vehemens impetus propter nullam obstantiam umbrarum eripit exhauriendo fervens ex planitie camporum umorem, et si quae sunt aquae apparentes, ex his, quod est levissimum tenuissimumque et subtili salubritate, aer avocans dissipat in impetum caeli, quaeque gravissimae duraeque et insuaves sunt partes, eae in fontibus campestribus relinquuntur.

The valleys between mountains receive the most rain. Dense woodland and the shade of trees and mountains preserve the snow there for longer; when it melts, it filters through veins in the earth and reaches the lowest mountain slopes, where it gushes out in springs. In the plains, by contrast, supplies cannot be abundant or wholesome. With no shade to obstruct it, the Sun’s fierce heat draws moisture from the exposed ground. Of any water that remains visible, the air carries away and disperses the lightest, finest and most wholesome parts, leaving the heaviest, hardest and least pleasant components in the springs of the plains.

Critical note — VIII.1. Water prospecting combines topographical, botanical and atmospheric signs. Creta, sabulo, glarea and saxum are translated according to their function in the passage without imposing excessively precise modern geological classifications. The excavation-test supplement ⟨tres, altus pedes⟩ remains visible as an editorial intervention.

Chapter 2

[1] Itaque, quae ex imbribus aqua colligitur, salubriores habet virtutes, quod eligitur ex omnibus fontibus levissimis subtilibusque tenuitatibus, deinde per aeris exercitationem percolata tempestatibus liquescendo pervenit ad terram. Etiamque non crebriter in campis confluunt imbres, sed in montibus aut ad ipsos montes, ideo quod umores ex terra matutino solis ortu moti cum sunt egressi, in quamcumque partem caeli sunt proclinati, trudunt aera; deinde, cum sunt moti, propter vacuitatem loci post se recipiunt aeris ruentis undas.

[1] Therefore, the water that is collected from the rains has more salubrious virtues, because it is selected from all the lightest and most subtle springs, and then, filtered by the exercise of the air, it reaches the ground, liquefied by storms. Moreover, the rains do not often flow in the plains, but in the mountains or on the mountains themselves, for this reason that the moistures, when they have emerged from the earth at the morning sunrise, are moved by the air in whatever part of the sky they are inclined to; then, when they are moved, because of the emptiness of the place, they receive the waves of the rushing air behind them.

[2] Aer autem, qui ruit, trudens quocumque umorem per vim spiritus impetus et undas crescentes facit ventorum. A ventis autem quocumque feruntur umores conglobati ex fontibus, et fluminibus et paludibus et pelago, cum tepores solis colligunt et exhauriunt et ita tollunt in altitudinem nubes. Deinde cum aeris unda nitentes, cum perventum ad montes, ab eorum offensa et procellis propter plenitatem et gravitatem liquescendo disparguntur et ita diffunditur in terras.

[2] But the air, which rushes, pushing moisture wherever it is by the force of the breath, creates the gusts and rising waves of the winds. But wherever the winds carry the moisture gathered from springs, from rivers and marshes and the sea, they collect and drain it with the time of the sun and thus lift the clouds to a height. Then, shining with the wave of the air, when it reaches the mountains, it is dispersed by their impact and storms because of its fullness and gravity, melting and thus it is spread over the lands.

[3] Vaporem autem et nebulas et umores ex terra nasci haec videtur efficere ratio, quod ea habet in se et calores fervidos et spiritus inmanes refrigerationesque et aquarum magnam multitudinem. Ex eo, cum refrigeratum noctu sol oriens impetu tangit orbem terrae et ventorum flatus oriuntur per tenebras, ab umidis

locis egrediuntur in altitudinem nubes. Aer autem cur a sole percalefactus cum rationibus tollit ex terra umores, licet ex balineis exemplum capere.

The following explanation appears to account for the generation of vapor, mist and moisture from the earth: the earth contains intense heat, powerful currents of air, cold and great quantities of water. When the rising Sun strikes its surface, cooled during the night, and winds arise in the darkness, clouds rise from damp places into the air. The way air heated by the Sun lifts moisture from the earth may be understood by considering baths.

[4] Nullae enim camerae, quae sunt caldariorum, supra se possunt habere fontes, sed caelum, quod est ibi ex praefurniis ab ignis vapore percalefactum, corripit ex pavimentis aquam et aufert secum in camararum curvaturas et sustinet, ideo quod semper vapor calidus in altitudinem se trudit. Et primo non remittit propter brevitatem, simul autem plus umoris habet congestum, non potest sustinere propter gravitatem, sed stillat supra lavantium capita. Item eadem ratione caelestis aer, cum ab sole percepit calorem, ex omnibus locis hauriendo tollit umores et congregat ad nubes. Ita enim terra fervore tacta eicit umores, ⟨ut⟩ etiam corpus hominis ex calore emittit sudores.

The vaults over the hot rooms of baths cannot have springs above them. Instead, the air inside, heated by the fire at the furnaces, draws water from the floors, carries it up into the curved vaults and holds it there, because hot vapor always rises. At first, while the quantity is small, it does not release the moisture. Once more has accumulated, however, it can no longer support the weight, and water drips onto the bathers' heads. In the same way, atmospheric air warmed by the Sun draws moisture from every place and gathers it into clouds. Heat causes the earth to give off moisture just as it causes the human body to sweat.

[5] Indices autem sunt eius rei venti, ex quibus qui a frigidissimis partibus veniunt procreati, septentrio et aquilo, extenuatos siccitatibus in aere flatus spirant; auster vero et reliqui, qui a solis cursu impetum faciunt, sunt umidissimi et semper adportant imbres, quod percalefacti ab regionibus fervidis adveniunt, et omnibus terris lambentes eripiunt umores et ita eos profundunt ad septentrionales regiones.

[5] But the indications of this are the winds, which, when they come from the coldest parts, are born from the north and the north-east, and breathe in the air, weakened by the dryness; but the south and the others, which come from the

course of the sun, are very humid and always bring rain, because they arrive very hot from the hot regions, and, sliding down, they snatch the moisture from all the lands and thus carry it deeper to the northern regions.

[6] Haec autem sic fieri testimonio possunt esse capita fluminum, quae orbe terrarum chorographiis picta itemque scripta plurima maximaque inveniuntur egressa ad septentrionem. Primumque in India Ganges et Indus ab Caucaso monte oriuntur; Syria Tigris et Euphrates; Asiae item, Ponto Borysthenes, Hypanis, Tanais; Colchis Phasis; Gallia Rhodanus; Celtica Rhenus; citra Alpis Timavos et Padus; Italia Tiberis; Maurusia, quam nostri Mauretaniam appellant, ex monte Atlante Dyris, qui ortus ex septentrionali regione progreditur per occidentem ad lacum Eptagonum et mutato nomine dicitur Agger, deinde ex lacu Eptabolo sub montes desertos subterfluens per meridiana loca manat et influit in Paludem quae appellatur, circumcingit Meroen, quod est Aethiopum meridianorum regnum, ab hisque paludibus se circumagens per flumina Astansobam et Astoboam et alia plura pervenit per montes ad cataractam ab eoque se praecipitans per septentrionalem pervenit inter Elephantida et Syenen Thebaicosque in Aegyptum campos et ibi Nilus appellatur.

The river sources shown on maps and described in accounts of the world provide evidence for this explanation: many of the greatest rivers emerge in northern regions. In India the Ganges and Indus rise from the Caucasus; in Syria, the Tigris and Euphrates; in Asia, in the region of Pontus, the Borysthenes, Hypanis and Tanais; in Colchis, the Phasis; in Gaul, the Rhône; in Celtic territory, the Rhine; on this side of the Alps, the Timavus and Po; and in Italy, the Tiber. In Maurusia, which our people call Mauretania, the river Dyris rises from Mount Atlas, flows from the northern region westwards to Lake Eptagonus and changes its name to Agger. From Lake Eptabolus it passes beneath the desert mountains, flows through southern regions and enters the marshes that surround Meroë, the kingdom of the southern Ethiopians. From these marshes it winds through the Astansobas, Astoboa and several other rivers, crosses the mountains to the cataract, plunges down and flows northwards between Elephantine and Syene through the Theban plains into Egypt, where it is called the Nile.

[7] Ex Mauretania autem caput Nili profluere ex eo maxime cognoscitur, quod ex altera parte montis Atlantis alia capita item profluentia ad occidentem

Oceanum, ⟨petunt⟩ ibique nascuntur ichneumones, crocodili, aliae similes bestiarum pisciumque naturae praeter hippopotamos.

[7] But it is best known that the head of the Nile flows from Mauretania, because from the other side of the mountain of Atlantis other heads also flow towards the western Ocean, and there are born ichneumons, crocodiles, and other similar animals and fish, besides hippopotamuses.

[8] Ergo cum omnia flumina magnitudinibus in orbis terrarum descriptionibus a septentrione videantur profluere Afrique campi, qui sunt in meridianis partibus subiecti solis cursui, latentes penitus habeant umores nec fontes crebros amnesque raros, relinquitur, uti multo meliora inveniantur capita fontium, quae ad septentrionem aut aquilonem spectant, nisi si inciderint in sulphurosum locum aut aluminosum seu bituminosum. Tunc enim permutantur <et> aut calidae aquae aut frigidae odore malo et sapore profundunt fontes.

[8] Therefore, since all rivers seem to flow from the north in their magnitudes in descriptions of the world, the plains of Africa, which are in the southern parts subject to the course of the sun, have completely hidden moisture, and neither frequent springs nor rare rivers, it remains that much better sources should be found which face the north or northeast, unless they fall into a sulphurous or aluminous or bituminous place. For then they are exchanged <and> either hot waters or cold ones deepen the springs with a bad smell and taste.

[9] Neque enim calidae aquae est ulla proprietas, sed frigida aqua, cum incidit percurrens in ardentem locum, effervescit et percalefacta egreditur per venas extra terram. Ideo diutius non potest permanere, sed brevi spatio fit frigida. Namque si naturaliter esset calida, non refrigeraretur calor eius. Sapor autem et odor et color eius non restituitur, quod intinctus et commixtus est propter naturae raritatem.

[9] For hot water has no property, but cold water, when it falls as it flows into a burning place, boils and, being very hot, comes out through the veins outside the earth. Therefore it cannot remain longer, but in a short space becomes cold. For if it were naturally hot, its heat would not be cooled. But its taste, smell and color are not restored, because it is mixed and mixed, due to the rarity of nature.

Historical and critical note — VIII.2. The chain linking rain, vapor, clouds, mountains and river sources is translated as Vitruvius's causal explanation. Assertions about the northern origins of major rivers and the Nile belong to

ancient physical geography; a modern correction should be made in the commentary rather than inserted into his argument.

Chapter 3

[1] Sunt autem etiam nonnulli fontes calidi, ex quibus profluit aqua sapore optimo, quae in potione ita est suavis, uti nec fontalis ab Camenis nec Marcia saliens desideretur. Haec autem ab natura perficiuntur his rationibus. Cum in imo per alumen aut bitumen seu sulphur ignis excitatur, ardore percandefacit terram, quae est supra se; item fervidum emittit in superiora loca vaporem, et ita, si qui in îs locis, qui sunt supra, fontes dulcis aquae nascuntur, offensi eo vapore effervescunt inter venas et ita profluunt incorrupto sapore.

[1] There are also some hot springs, from which flow water of excellent taste, which is so sweet in drink, that neither the spring of the Camenae nor the Marcian water (the Aqua Marcia) is desired. But these are accomplished by nature in these ways. When fire is excited at the bottom by alum or bitumen or sulphur, it scorches the earth above it with its heat; and it emits a hot vapor into the higher places, and so, if in any of these places, which are above, springs of sweet water arise, offended by that vapor they boil between the veins and thus flow forth without any corrupting taste.

[2] Sunt etiam odore et sapore non bono frigidi fontes, qui ab inferioribus locis penitus orti per loca ardentia transeunt et ab eo per longum spatium terrae percurrentes refrigerati perveniunt supra terram sapore odore coloreque corrupto, uti in Tiburtina via flumen Albula et in Ardeatino fontes frigidi eodem odore, qui sulphurati dicuntur, et reliquis locis similibus. Hi autem, cum sunt frigidi, ideo videntur aspectu fervere, quod, cum in ardentem locum alte penitus inciderunt, umore et igni inter se congruentibus offensa vehementi fragore validos recipiunt in se spiritus, et ita inflati vi venti coacti bullientes crebre per fontes egrediuntur. Ex his autem qui non sunt aperti, sed ⟨grumis⟩ aut saxis continentur, per angustas venas vehementia spiritus extruduntur ad summos grumorum tumulos.

[2] There are also cold springs with a bad smell and taste, which, rising from deep below, pass through burning places and from there, running over a long distance of land, reach the surface of the earth cooled with a spoiled smell and color, as in the Tiburtine road the river Albula and in the Ardeatine cold springs with the same smell, which are called sulphurous, and in other similar places. But these, when they are cold, seem to boil to the eye because, when they have fallen deeply into a burning place, the moisture and fire, which are in harmony

with each other, are struck with a violent crash and receive strong spirits into themselves, and thus, being inflated by the force of the wind, they frequently come out bubbling through the springs. But from those which are not open, but are contained by rocks, the spirits are forced out through narrow veins to the highest mounds of the cairns by the force of the wind.

[3] Itaque qui putant se altitudine, qua sunt grumi, capita fontium posse habere, cum aperiunt fossuras latius, decipiuntur. Namque uti aeneum vas non in summis labris plenum sed aquae mensurae suae capacitatis habens ⟨e⟩ tribus duas partes operculumque in eo conlocatum, cum ignis vehementi fervore tangatur, percalefieri cogit aquam, ea autem propter naturalem raritatem in se recipiens fervoris validam inflationem non modo implet vas, sed spiritibus extollens operculum et crescens abundat, sublato autem operculo emissis inflationibus in aere patenti rursus ad suum locum residit: ad eundem modum ea capita fontium cum sunt angustiis compressa, ruunt in summo spiritus aquae bullitus, simul autem sunt latius aperti, exanimati per raritates liquidae potestatis residunt et restituuntur in libramenti proprietatem.

[3] Therefore, those who think that they can have the heads of springs from the height of the clods, when they open the trenches wider, are deceived. For as a brass vessel, not filled to the very brim, but having two-thirds of its capacity of water, and a lid placed in it, when the fire is touched with intense heat, forces the water to become very hot, but the water, due to its natural rarefaction, receiving within itself a strong inflation of heat, not only fills the vessel, but also lifts the lid with spirits and increases in abundance, but when the lid is lifted, the inflations are released and it returns to its place in the open air. In the same way, when those heads of springs are compressed by narrow spaces, the boiling spirits of the water rush in at the top, but at the same time they are opened wider, tested by the rarities of the liquid power, they settle and are restored to their property of balance.

[4] Omnis autem aqua calida ideo [quod] est medicamentosa, quod in pravis rebus percocta aliam virtutem recipit ad usum. Namque sulphurosi fontes nervorum labores reficiunt percalefaciendo exurendoque caloribus e corporibus umores vitiosos. Aluminosi autem, cum dissoluta membra corporum paralysi aut aliqua vi morbi receperunt, fovendo per patentes venas refrigerationem contraria caloris vi reficiunt, et hoc continenter restituuntur in antiquam membrorum

curationem. Bituminosi autem interioris corporis vitia potionibus purgando solent mederi.

[4] But all hot water is medicinal because it receives its healing power for use in bad cases. For sulphurous springs relieve the labors of the nerves by heating them and burning away the foul humours from the bodies with their heat. But aluminous springs, when the limbs of the body have become weak due to paralysis or some disease, by warming them through the open veins they relieve the body by the opposite force of heat, and this continually restores the limbs to their former health. But bituminous springs are wont to cure the vices of the interior of the body by cleansing them with potions.

[5] Est autem aquae frigidae genus nitrosum, uti Pinnae Vestinae, Cutiliis aliisque locis similibus, quae potionibus depurgat per alvumque transeundo etiam strumarum minuit tumores. Ubi vero aurum, argentum, ferrum, aes, plumbum reliquaeque res earum similes fodiuntur, fontes inveniuntur copiosi, sed hi maxime sunt vitiosi. Habent enim uti aquae calidae sulphur alumen bitumen, faecem, quae, per potiones cum in corpus iniit et per venas permanando nervos attingit et artus, eos durat inflando. Igitur nervi inflatione turgentes e longitudine contrahuntur et ita aut nervicos aut podagricos efficiunt homines, ideo quod ex durissimis et spissioribus rigidissimisque rebus intinctas habent venarum raritates.

[5] There is also a kind of cold water, nitrous, as in Pinnae Vestinae, Cutilii, and other similar places, which purifies by drinking and, passing through the bowels, also reduces the swellings of the goiters. But where gold, silver, iron, copper, lead, and other similar things are mined, springs are found in abundance, but these are especially vitiated. For hot vitriolic waters contain sulphur, alum, and bitumen, and when these enter the body through drinks and continue through the veins, they reach the nerves and joints, hardening them by swelling them. Therefore, the nerves, swelling by swelling, contract in length and thus make men neurasthenic or gouty, because they have the rarefied veins soaked in the hardest and thickest and coldest things.

[6] Aquae autem species est, quae cum habeat non satis perlucidas et ipsa uti flos natat in summo, colore similis vitri purpurei. Haec maxime considerantur Athenis. Ibi enim ex eiusmodi locis et fontibus in asty et ad portum Piraeum ducti sunt salientes, e quibus bibit nemo propter eam causam, sed lavationibus et

reliquis rebus utuntur, bibunt autem ex puteis et ita vitant eorum vitia. Troezeni non potest id vitari, quod omnino aliud genus aquae non reperitur, nisi quod cibdeli habeant; itaque in ea civitate aut omnes aut maxima parte sunt pedibus vitiosi. Cilicia vero civitate Tarso flumen est nomine Cydnos, in quo podagrici crura macerantes levantur dolore.

[6] But there is a kind of water which, though not sufficiently transparent, and which itself floats like a flower on the top, is of a color similar to purple glass. These are most highly regarded in Athens. For there, from such places and springs, springs have been brought to Asty and to the port of Piraeus, from which no one drinks for that reason, but they use washings and other things, but they drink from wells and thus avoid their vices. This cannot be avoided in the Troezen, for no other kind of water is found at all, except as many as they have; and therefore in that city either all or the greater part are defective in their feet. But in the Cilician city of Tarsus there is a river called Cydnus, in which gouty sufferers, soaking their legs, are relieved of their pain.

[7] Sunt autem et alia multa genera, quae habent suas proprietates, ut in Sicilia flumen est Himeras, quod a fonte cum est progressum, dividitur in duas partes; quae pars profluit contra Etruriam, quod per terrae dulcem sucum percurrit, est infinita dulcedine, quae altera parte per eam terram currit, unde sal foditur, salsum habet saporem. Item Paraetonio et quod est iter ad Ammonem et Casio ad Aegyptum lacus sunt palustres, qui ita sunt salsi, ut habeant insuper se salem congelatum. Sunt autem et aliis pluribus locis et fontes et flumina <et> lacus, qui per salifodinas percurrentes necessario salsi perficiuntur.

[7] But there are also many other kinds, which have their own properties, as in Sicily there is a river called Himeras, which, when it has advanced from its source, is divided into two parts; the part which flows towards Etruria, which runs through the sweet juice of the land, is of infinite sweetness, while the other part which runs through that land, from which salt is mined, has a salty taste. Likewise, in Paraetonium and on the road to Ammon and Cassius in Egypt there are marshy lakes, which are so salty that they have frozen salt on top of them. But there are also in many other places springs and rivers <and> lakes, which, running through salt mines, are necessarily made salty.

[8] Alii autem per pingues terrae venas profluentes uncti oleo fontes erumpunt, uti Solis, quod oppidum est Ciliciae, flumen nomine Liparis, in quo natantes aut

lavantes ab ipsa aqua unguntur. Similiter Aethiopiae lacus est, qui unctos homines efficit, qui in eo nataverint, et India, qui sereno caelo emittit olei magnam multitudinem, item Carthagini fons, in quo natat insuper oleum, odore uti scobe citreo; quo oleo etiam pecora solent ungere. Zacyntho et circa Dyrrachium et Apolloniam fontes sunt, qui picis magnam multitudinem cum aqua evomunt. Babylone lacus amplissima magnitudine, qui λίμνη ἀσφάλτιτις appellatur, habet supra natans liquidum bitumen; quo bitumine et latere testaceo structum murum Samiramis circumdedit Babyloni. Item Iope in Syria Arabiaque Nomadum lacus sunt inmani magnitudine, qui emittunt bituminis maximas moles, quas diripiunt qui habitant circa.

[8] But others, flowing through the veins of the earth, burst forth with oil-anointed springs, as at Solis, a town in Cilicia, a river called Liparis, in which those who swim or wash are anointed by it. Similarly, there is a lake in Ethiopia which makes men anointed who swim in it, and India, which, when the sky is clear, emits a great quantity of oil, as well as a spring in Carthage, in which oil also floats, with a smell like that of lemon grass; with which oil they also anoint cattle. At Zacynthus and around Dyrrachium and Apollonia there are springs which spew out a great quantity of pitch with water. At Babylon a lake of very large size, which is called λίμνη ἀσφαλτῖτις, has liquid bitumen floating on it; with which bitumen and earthenware brick wall was built at Sameramis surrounding Babylon. Likewise at Joppa in Syria and Arabia there are lakes of the Numidians of enormous size, which emit the greatest quantities of bitumen, which those who live around plunder.

[9] Id autem non est mirandum; nam crebrae sunt ibi lapidicinae bituminis duri. Cum ergo per bituminosam terram vis erumpit aquae, secum extrahit et, cum sit egressa extra terram, secernitur et ita reicit ab se bitumen. Etiamque est in Cappadocia in itinere, quod est inter Mazaca et Tyana, lacus amplus, in quem lacum pars sive harundinis sive alii generis si demissa fuerit et postero die exempta, ea pars, quae fuerit exempta, invenietur lapidea, quae autem pars extra aquam manserit, permanet in sua proprietate.

[9] But this is not to be wondered at; for there are frequent stony deposits of hard bitumen there. Therefore, when the force of the water bursts through bituminous soil, it draws it with it, and when it has gone out of the ground, it is separated and thus throws the bitumen from itself. And there is also in

Cappadocia, on the road, which is between Mazaca and Tyana, a large lake, into which lake if a piece of reed or of some other kind is dropped and taken out the next day, that part which was taken out will be found to be stony, but the part which remained outside remains in its own right.

[10] Ad eundem modum Hierapoli Phrygiae effervet aquae calidae multitudo, e quibus circum hortos et vineas fossis ductis inmittitur; haec autem efficitur post annum crusta lapidea. Ita quotannis dextra ac sinistra margines ex terra faciundo inducunt eam et efficiunt his crustis in agris saepta. Hoc autem ita videtur naturaliter fieri, quod in îs locis et ea terra, quibus is nascitur, sucus subest coaguli naturae similis; deinde cum commixta vis egreditur per fontes extra terram, a solis et aeris calore cogitur congelari, ut etiam in areis salinarum videtur.

[10] In the same way, at Hierapolis in Phrygia, a multitude of hot waters boil, from which they are let in through ditches around the gardens and vineyards; but this becomes a crust of stone after a year. Thus every year on the right and left they introduce it by making the edges of the earth and make fences in the fields in these crusts. But this seems to happen naturally, because in these places and the land in which it is born, the juice is under the nature of a clot; then when the mixed force comes out of the earth through springs, it is forced to freeze by the heat of the sun and the air, as is also seen in the air of salt lakes.

[11] Item sunt ex amaro suco terrae fontes exeuntes vehementer amari, ut in Ponto est flumen Hypanis. ⟨is⟩ A capite profluit circiter milia XL sapore dulcissimo; deinde, cum pervenit ad locum, qui est ab ostio ad milia CLX, admiscetur ei fonticulus oppido quam parvulus. Is cum in eum influit, tunc tantam magnitudinem fluminis facit amaram, ideo quod per id genus terrae et venas, unde sandaracam fodiunt, ea aqua manando perficitur amara.

[11] Likewise, there are springs issuing from the bitter juice of the earth, which are exceedingly bitter, as in Pontus is the river Hypanus. From its head it flows about 40 miles with a very sweet taste; then, when it reaches a place which is 160 miles from the mouth, a small spring is mixed with it, which is very small. When it flows into it, then by the greatness of the river it becomes bitter, for this reason, because through that kind of earth and the veins from which they dig sandaraca, the water is made bitter by flowing.

[12] Haec autem dissimilibus saporibus a terrae proprietate perficiuntur, uti etiam in fructibus videtur. Si enim radices arborum aut vitium aut reliquorum seminum non ex terrae proprietatibus sucum capiendo ederent fructus, uno genere essent in omnibus locis et regionibus omnium sapores. Sed animadvertimus insula Lesbo vinum protropum, Maeonia Catacecaumeniten, Lydia Tmoliten, Sicilia Mamertinum, Campania Falernum, Terracina et Fundis Caecubum reliquisque locis pluribus innumerabili multitudine genera vini virtutesque procreari. Quae non aliter possunt fieri, nisi, cum terrenus umor suis proprietatibus saporis in radicibus sit infusus, enutrit materiam per quam egrediens ad cacumen profundat proprium loci et generis sui ⟨in⟩ fructus saporem.

[12] But these are perfected with dissimilar flavors by the properties of the earth, as is also seen in fruits. For if the roots of trees or vines or other seeds did not produce fruit by drawing juices from the properties of the earth, the flavors of all would be of one kind in all places and regions. But we observe that the island of Lesbos produces protropous wine, Maeonia Catacecaumene, Lydia Tmolite, Sicily Mamertine, Campania Falerno, in Terracina and Fundis Caecubus and many other places in an innumerable multitude, kinds of wine and virtues are produced. Which cannot be done otherwise, unless, when the earthly moisture is infused with its properties of flavor in the roots, it nourishes the matter through which, rising to the top, it deepens the flavor proper to the place and kind of fruit.

[13] Quodsi terra generibus umorum non esset dissimilis et disparata, non tantum in Syria et Arabia in harundinibus et iuncis herbisque omnibus essent odores, neque arbores turiferae, neque piperis darent bacas, nec murrae glaebulae, nec Cyrenis in ferulis laser nasceretur, sed in omni terra regionibus eodem genere omnia procrearentur. Has autem varietates terrae umoris qualitatis regionibus et locis inclinatio mundi et solis impetus propius aut longius cursum faciendo tales efficit nec solum in his rebus, sed etiam in pecoribus et armentis haec non ita similiter efficerentur, nisi proprietates singularum terrarum ⟨umorum⟩ in regionibus ad solis potestatem temperarentur.

[13] But if the earth were not dissimilar and disparate in the kinds of moisture, not only would there be odours in the reeds and rushes and all the herbs in Syria and Arabia, nor would frankincense trees, nor peppercorns yield berries, nor myrrh clusters, nor would Cyrene produce a laser in its canes, but in every region

of the earth everything would be produced in the same kind. Now these varieties in regions and places are produced by the inclination of the world and by the influence of the sun, by making its course nearer or farther, such are the qualities of the earth and the moisture, and not only in these things, but also in cattle and herds, these would not be produced in such a similar way, unless the properties of the individual lands in the regions were tempered to the power of the sun.

[14] Sunt enim Boeotiae flumina Cephisos et Melas, Lucanis Crathis, Troia Xanthus inque agris Clazomeniorum et Erythraeorum et Laodicensium fontes. Ad ⟨ea⟩ flumina cum pecora suis temporibus anni parantur ad conceptionem partus, per id tempus adiguntur eo cotidie potum, ex eoque, quamvis sint alba, procreant aliis locis leucophaea, aliis locis pulla, aliis coracino colore. Ita proprietas liquoris, cum inît in corpus, proseminat intinctam sui cuiusque generis qualitatem. Igitur quod in campis Troianis proxime flumen armenta rufa et pecora leucophaea nascuntur, ideo id flumen Ilienses Xanthum appellavisse dicuntur.

[14] For the rivers of Boeotia are Cephisos and Melas, of Lucania Crathis, of Troy Xanthus, and in the fields of the Clazomenians and Erythraeans and Laodiceans springs. At the rivers with their cattle at their proper times of the year they are prepared for conception and birth, during that time they are driven to drink it daily, and from it, although they are white, in some places they produce white, in others a fawn, in others a raven-colored. Thus the property of the liquid, when it is in the body, reveals the inherent quality of each of its kinds. Therefore, because in the Trojan plains red cattle and white cattle are born near the river, the Ilians are said to have called that river Xanthus.

[15] Etiamque inveniuntur aquae genera mortifera, quae per maleficum sucum terrae percurrentia recipiunt in se vim venenatam, uti fuisse dicitur Terracinae fons, qui vocabatur Neptunius, ex quo qui biberant inprudentes, vita privabantur; quapropter antiqui eum obstruxisse dicuntur. Et Chrobsi Thracia lacus ex quo non solum qui biberint, moriuntur, sed etiam qui laverint. Item in Thessalia fons est profluens, ex quo fonte nec pecus ullum gustat nec bestiarum genus ullum propius accedit; ad quem fontem proxime est arbor florens purpureo colore.

[15] And there are also found kinds of waters that are deadly, which, flowing through the earth through the malefic juice, receive within themselves a

poisonous force, as is said to have been the fountain of Terracina, which was called Neptune, from which those who drank unwisely were deprived of life; for which reason the ancients are said to have blocked it. And the lake of Chrobsi in Thrace, from which not only those who drank die, but also those who washed. Likewise in Thessaly there is a spring flowing, from which no cattle taste nor does any kind of beast approach; near which spring is a tree flowering with a purple color.

[16] Non minus in Macedonia quo loci sepultus est Euripides, dextra ac sinistra monumenti advenientes duo rivi concurrunt. In unum, e quibus ad unum accumbentes viatores pransitare solent propter aquae bonitatem, ad rivum autem, qui est ex altera parte monumenti, nemo accedit, quod mortiferam aquam dicitur habere. Item est in Arcadia Nonacris nominata terrae regio, quae habet in montibus ex saxo stillantes frigidissimos umores. Haec autem aqua Στυγός ὕδωρ nominatur, quam neque argenteum neque aeneum nec ferreum vas potest sustinere, sed dissilit et dissipatur. Conservare autem eam et continere nihil aliud potest nisi mulina ungula, qua etiam memoratur ab Antipatro in provinciam ubi erat Alexander, per Iollam filium perlata esse et ab eo ea aqua regem esse necatum.

[16] No less in Macedonia, where Euripides is buried, two streams meet on the right and left of the monument. In one, travelers are accustomed to dine because of the goodness of the water, but no one approaches the stream that is on the other side of the monument, because it is said to have deadly water. Likewise, in Arcadia there is a region of land called Nonacris, which has very cold waters dripping from the rocks on the mountains. This water is called Stygian water, which neither silver nor bronze nor iron vessels can hold, but breaks and is dissipated. But nothing else can preserve and contain it except a hoof mill, which is also mentioned to have been carried by Antipater to the province where Alexander was, by his son Iollas, and by him the king was killed by the water.

[17] Item Alpibus in Cottii regno est aqua; ex qua qui gustant, statim concidunt. Agro autem Falisco via Campana in campo Corneto est lucus, in quo fons oritur; ibique avium et lacertarum reliquarumque serpentium ossa iacentia apparent.

[17] Likewise, in the Alps, in the kingdom of Cottus, there is water; those who taste it immediately fall to their deaths. But in the Faliscan country, on the

Campanian road, in the plain of Cornetus, there is a grove in which a spring rises; everywhere the bones of birds and lizards and other serpents are seen lying.

Item sunt nonnullae acidae venae fontium, uti Lyncesto et in Italia Velino, Campania Teano aliisque locis pluribus, quae hanc habent virtutem, uti calculos, in vesicis qui nascuntur in corporibus hominum potionibus discutiant.

Likewise, there are some acidic veins of springs, such as Lyncestus and in Italy Velino, Teano in Campania and many other places, which have this power, such as dissolving stones in the bladders that are formed in the bodies of men by drinking.

Moreover, there is water in the Alps, in the kingdom of Cottius, which makes those who taste it drop dead at once. Now in the Faliscan territory, along the Campana Way, in the field of Cornetum, there is a grove in which a spring rises; all around are seen the bones of birds, lizards, and other serpents.

There are also certain acidic springs, as at Lyncestus and Velinus in Italy, at Teanum in Campania, and in many other places, which have this power—like certain stones—of dispersing the stones that form in the bodies of men.

[18] Fieri autem hoc naturaliter ideo videtur, quod acer et acidus sucus subest in ea terra, per quam egredientes venae intinguntur acritudine, et ita, cum in corpus inierunt, dissipant quae ex aquarum subsidentia in corporibus et concrescentia offenderunt. Quare autem discutiantur ex acidis eae res, sic possumus animadvertere. Ovum in aceto si diutius positum fuerit, cortex eius mollescet et dissolvetur. Item plumbum, quod est lentissimum et gravissimum, si in vase conlocatum fuerit et in eo acetum suffusum, id autem opertum et oblitum erit, efficietur, uti plumbum dissolvatur, et fiat cerussa.

[18] This seems to happen naturally because there is a sharp and acidic juice in the earth, through which the veins that emerge are dipped in the sharpness, and thus, when they enter the body, they disperse what they have encountered from the subsidence of the waters in the bodies and their concretion. But why these things are dispersed by acids, we can observe in this way. If an egg is left in vinegar for a long time, its shell will soften and dissolve. Likewise, lead, which is very slow and heavy, if it is placed in a vessel and vinegar is poured into it, but this is covered and forgotten, it will be made to dissolve like lead, and become lead.

[19] Eisdem rationibus aes, quod etiam solidiore est natura, similiter curatum si fuerit, dissipabitur et fiet aerugo. Item margarita. Non minus saxa silicea, quae neque ferrum neque ignis potest per se dissolvere, cum ab igni sunt percalefacta, aceto sparso dissiliunt et dissolvuntur. Ergo cum has res ante oculos ita fieri videamus, ratiocinemur isdem rationibus ex acidis propter acritudinem suci etiam calculosos e natura rerum similiter posse curari.

[19] By the same reasoning, if bronze, which is also more solid by nature, is similarly cured, it will disintegrate and become rust. Likewise pearl. No less do flint stones, which neither iron nor fire can dissolve by themselves, when they are heated by fire, disintegrate and dissolve when sprinkled with vinegar. Therefore, since we see these things happening before our eyes, let us reason by the same reasoning that stones that are naturally calcified can also be cured by acids because of the acridity of the juice.

[20] Sunt autem etiam fontes uti vino mixti, quemadmodum est unus Paphlagoniae, ex quo eam aquam sine vino potantes fiunt temulenti. Aequiculis autem in Italia et in Alpibus natione Medullorum est genus aquae, quam qui bibunt, efficiuntur turgidis gutturibus.

[20] There are also springs mixed with wine, as is the case in Paphlagonia, from which those who drink it without wine become intoxicated. But among the Aequi in Italy and in the Alps, among the Medullae, there is a kind of water, which makes those who drink it swell up in their throats.

[21] Arcadia vero civitas est non ignota Clitor, in cuius agris est spelunca profluens aqua, e qua qui biberint, fiunt abstemii. Ad eum autem fontem epigramma est in lapide inscriptum: hac sententia versibus graecis: eam non esse idoneam ad lavandum, sed etiam inimicam vitibus, quod apud eum fontem Melampus sacrificiis purgavisset rabiem Proeti filiarum restituissetque earum virginum mentes in pristinam sanitatem. epigramma autem est id, quod est subscriptum:

21. In Arcadia lies the well-known city of Clitor, in whose territory a cave gives forth water that makes those who drink it abstain from wine. Beside the spring a Greek epigram is inscribed on stone. It says that the water is unsuitable for bathing and hostile to vines, because at this spring Melampus had purified the madness of the daughters of Proetus through sacrifices and restored the maidens' minds to their former health. The epigram reads:

ἀγρότα, σὺν ποίμναις τὸ μεσημβρινὸν ἤν σε βαρύνῃ
δίψος ἀν' ἐσχατιὰς Κλείτορος ἐρχόμενον,
ταῖς μὲν ἀπὸ κρήνης ἄρυσαι πόμα καὶ παρὰ νύμφαις
ὑδριάσιν στῆσον πᾶν τὸ σὸν αἰπόλιον·
ἀλλὰ σὺ μήτ' ἐπὶ λουτρὰ βάλῃς χρόι, μή σε καὶ αὔρη
πη⟨μή⟩νῃ ⟨τερπνῆς⟩ ἐντὸς ἐόντα μέθης·
φεῦγε δ' ἐμὴν πηγὴν μισάμπελον, ἔνθα Μελάμπους
λυσάμενος λύσσης Προιτίδας ἀρτεμέας
πάντα καθαρμὸν ἔβαψεν ἀπόκρυφον, ⟨εὖτ' ἄρ' ἀπ' Ἄργους
οὔρεα τρηχείης ἤλυθεν Ἀρκαδίης⟩.

Countryman, if midday thirst weighs upon you as you travel
with your flocks through the bounds of Clitor,
draw a drink from the spring, and beside the water-nymphs
halt your whole herd of goats.
But do not bathe your body in its water, lest its breath
harm you amid the pleasures of intoxication.
Shun my spring, the enemy of the vine, where Melampus,
after freeing the daughters of Proetus from their madness,
immersed the whole secret purification, when from Argos
he came to the mountains of rugged Arcadia.

[22] Item est in insula Cia fons e quo qui inprudentes biberint, fiunt insipientes, et ibi est epigramma insculptum ea sententia: iucundam eam esse potionem fontis eius, sed qui biberit, saxeos habiturum sensus. Sunt autem versus hi:

22. On the island of Ceos there is also a spring whose water makes those who drink it unwittingly lose their reason. An inscribed epigram says that the water is pleasant to drink, but that whoever drinks it will acquire the senses of a stone. The verses run:

ἡδεῖα ψυχροῦ πόματος λιβάς, ἣν ἀναβάλλει
⟨πηγή, ἀλλ' ἄνοος⟩ πέτρος ὁ τῆσδε πιών.

Sweet is the stream of cool water that the spring sends forth;
but whoever drinks of it becomes a stone without understanding.

[23] Susis autem, in qua civitate est regnum Persarum, fonticulus est ex quo qui biberint amittunt dentes. Item in eo est scriptum epigramma quod significat hanc sententiam: egregiam esse aquam ad lavandum, sed ea si bibatur, excutere e radicibus dentes. Et huius epigrammatos sunt versus graece:

23. At Susa, the city of the Persian kings, there is a small spring whose water causes those who drink it to lose their teeth. Its epigram says that the water is excellent for washing, but drinking it dislodges the teeth by their roots. Its Greek verses run:

ὕδατα κρανάεντα βλέπεις, ξένε, τῶν ἄπο χερσὶν
λουτρὰ μὲν ἀνθρώποι⟨ς ἀβλαβῆ ἔστιν ἔχειν·⟩
ἢν δὲ λάβῃς κοίλου βοτανήδεος ἀγλαὸν ὕδωρ
⟨ἄκρα μόνον δολιχοῦ χείλεος ἁψάμενος,⟩
αὐτῆμαρ πριστῆρες ⟨ἐπὶ χθονὶ⟩ δαιτὸς ὀδόντες
πίπτουσιν, γενύων ὀρφανὰ θέντες ἕδη.

Stranger, you see spring water from which men may take
water in their hands and bathe without harm.
But if you drink the bright water of the hollow, grass-grown spring,
merely touching it with the edge of your lips,
on that same day the teeth that grind your food fall to the ground,
leaving the sockets of your jaws bereft.

Textual note — VIII.3.22–23. Krohn (1912, 185–186) prints these epigrams in Greek with conjectural supplements. The supplied words and lines retain angle brackets in the Greek text. Αὐτῆμαρ means ‘on that same day’; the statement concerns the loss of teeth, not brushing them. The epigrams express the ancient account of the springs’ supposed effects and are presented as historical testimony.

[24] Sunt etiam nonnullis locis fontium proprietates, quae procreant qui ibi nascuntur egregiis vocibus ad cantandum, uti Tarso, Magnesiae, aliis eiusmodi regionibus. Etiamque Zama est civitas Afrorum, cuius moenia rex Iuba duplici muro saepsit ibique regiam domum sibi constituit. Ab ea milia passus XX est oppidum Ismuc, cuius agrorum regiones incredibili finitae sunt terminatione. Cum esset enim Africa parens et nutrix ferarum bestiarum, maxime serpentium, in eius agris oppidi nulla nascitur, et si quando adlata ibi ponatur, statim moritur; neque id solum, sed etiam terra ex his locis si alio translata fuerit, et ibi. Id genus terrae etiam Baleariibus dicitur esse. Sed aliam mirabiliorem virtutem ea habet terra, quam ego sic accepi.

24. In some places the properties of springs are also said to give those born there exceptionally fine singing voices, as at Tarsus, Magnesia and similar regions. Zama is an African city which King Juba enclosed with a double wall and made

the site of his royal residence. Twenty miles away lies Ismuc, whose territory has a remarkable natural boundary. Although Africa breeds and sustains wild creatures, especially snakes, none of these snakes is born in the town's territory; if one is brought there, it dies at once. Moreover, soil carried from that district is said to have the same effect elsewhere. Such soil is also reported in the Balearic Islands. The district has another, still more remarkable property, which I learned as follows.

[25] Gaius Iulius Masinissae filius, cuius erant totius oppidi agrorum possessiones, cum patre Caesare militavit. is hospitio meo est usus. Ita cotidiano convictu necesse fuerat de philologia disputare. Interim cum esset inter nos de aquae potestate et eius virtutibus sermo, exposuit esse in ea terra eiusmodi fontes, ut, qui ibi procrearentur, voces ad cantandum egregias haberent, ideoque semper transmarinos catlastros emere formosos et puellas maturas eosque coniungere, ut, qui nascerentur ex his, non solum voce egregia sed etiam forma essent non invenusta.

[25] Gaius Julius, the son of Masinissa, who owned the entire land of the town, served with his father Caesar. He enjoyed my hospitality. Thus, during our daily conversation, it was necessary to discuss philology. Meanwhile, when we were discussing the power of water and its virtues, he explained that there were such springs in that land that those who were born there had excellent singing voices, and therefore they always bought beautiful seamen from overseas and mated them with mature girls, so that those born of them would not only have excellent voices but also be not unattractive in appearance.

[26] Cum haec tanta varietas sit disparibus rebus natura distributa quod humanum corpus est ex aliqua parte terrenum, in eo autem multa genera sunt umorum, uti sanguinis, lactis, sudoris, urinae, lacrimarum: ergo si in parva particula terreni tanta discrepantia invenitur saporum, non est mirandum, si tanta in magnitudine terrae innumerabiles sucorum reperientur varietates, per quarum venas aquae vis percurrens tincta pervenit ad fontium egressus, et ita ex eo dispares variique perficiuntur in propriis generibus fontes propter locorum discrepantiam et regionum qualitates terrarumque dissimiles proprietates.

[26] Since such great variety is distributed by nature to disparate things, that the human body is in some part earthly, and in it there are many kinds of fluids, such as blood, milk, sweat, urine, tears: therefore if such a discrepancy of flavors is

found in a small particle of earth, it is not surprising if in such a large earth innumerable varieties of juices are found, through whose veins the water force, flowing, reaches the outlets of springs, and thus from this disparate and various springs are perfected in their own kinds, because of the discrepancy of places and the qualities of regions and the dissimilar properties of lands.

[27] Ex his autem rebus sunt nonnulla, quae ego per me perspexi, cetera in libris graecis scripta inveni, quorum scriptorum hi sunt auctores: Theophrastos, Timaeus, Posidonios, Hegesias, Herodotus, Aristides, Metrodorus, qui magna vigilantia et infinito studio locorum proprietates, regionum qualitates aquarum virtutes ab inclinatione caeli ita esse distributas scriptis dedicaverunt. Quorum secutus ingressus in hoc libro perscripsi quae satis esse putavi de aquae varietatibus, quo facilius ex his praescriptionibus eligant homines aquae fontes, quibus ad usum salientes possint ad civitates municipiaque perducere.

[27] Of these things, however, there are some which I have observed for myself, the rest I have found written in Greek books, the authors of which are: Theophrastus, Timaeus, Posidonius, Hegesias, Herodotus, Aristides, Metrodorus, who with great vigilance and untiring diligence have dedicated their writings to the properties of the waters, the powers of the waters according to the inclination of the heavens, and the qualities of the regions, as they are thus distributed. Following their introduction, I have written in this book what I thought was sufficient about the varieties of water, so that people may more easily choose from these prescriptions the sources of water which, when they rise, they may bring to cities and towns for use.

[28] Nulla enim ex omnibus rebus tantas habere videtur ad usum necessitates, quantas aqua, ideo quod omnium animalium natura, si frumenti fructu privata fuerit, arbustivo aut carne aut piscatu aut etiam qualibet ex his reliquis rebus escarum utendo poterit tueri vitam, sine aqua vero nec corpus animalium nec ulla cibi virtus potest nasci nec tueri nec parari. Quare magna diligentia industriaque quaerendi sunt et eligendi fontes ad humanae vitae salubritatem.

[28] For of all things, none seems to have such great necessities for use as water, for the reason that the nature of all animals, if deprived of the fruit of grain, will be able to maintain life by using trees or meat or fishing or any of these other things for food, but without water neither the body of animals nor any of the

virtues of food can be born, maintained or prepared. Therefore, great care and industry must be used to seek and choose sources for the health of human life.

Critical note — VIII.3. Hot, mineral, brackish and extraordinary waters require a distinction between observed phenomena, ancient explanation and modern identification. Sulphur, alumen, bitumen and other material names remain visible. Therapeutic properties are attributed to Vitruvius and ancient medicine. Greek epigrams are treated as transmitted or editorially constituted texts; their verse divisions and uncertainties must not be lost in a prose transcription.

Chapter 4

[1] Expertiones autem et probationes eorum sic sunt providendae. Si erunt profluentes et aperti, antequam duci incipiantur, aspiciantur animoque advertantur, qua membratura sint qui circa eos fontes habitant homines; et si erunt corporibus valentibus, coloribus nitidis, cruribus non vitiosis, non lippis oculis, erunt probatissimi. Item si fons novus fossus fuerit, et in vas corinthium sive alterius generis, quod erit ex aere bono, ea aqua sparsa maculam non fecerit, optima est. Itemque in aeneo si ea aqua defervefacta et postea requieta et defusa fuerit, neque in eius aenei fundo harena aut limus invenietur, ea aqua erit item probata.

[1] But their tests and proofs are to be provided in this way. If they are flowing and open, before they begin to be led, let them be observed and noted in their minds, what kind of members the people who live around those springs are; and if they are of strong bodies, bright colors, legs not defective, and eyes not flawed, they will be most approved. Likewise, if a new spring has been dug, and in a Corinthian vessel or another kind, which will be of good brass, the water does not stain when poured, it is the best. Likewise, in a bronze one, if the water has been boiled and then rested and poured out, and neither sand nor silt is found in its bronze bottom, the water will also be approved.

[2] Item si legumina in vas cum ea aqua coniecta ad ignem posita celeriter percocta fuerint, indicabunt aquam esse bonam et salubrem. Non etiam minus ipsa aqua, quae erit in fonte, si fuerit limpida et perlucida, quoque pervenerit aut profluxerit, muscus non nascetur neque iuncus, neque inquinatus ab aliquo inquinamento is locus fuerit, sed puram habuerit speciem, in⟨dica⟩bitur his signis esse tenuis et summa salubritate.

[2] Likewise, if vegetables are placed in a vessel with water and quickly boiled over a fire, they will indicate that the water is good and wholesome. Not least, if the water itself, which is in a spring, is clear and transparent, and if it flows or flows, and if moss or rushes do not grow, and if the place is not polluted by any pollution, but has a pure appearance, these signs indicate that it is pure and in the highest health.

Critical note — VIII.4. Expertiones and probationes denote empirical tests: the inhabitants' condition, marks in bronze vessels, residue after boiling, the

cooking of pulses and the appearance of a spring. They are preserved as ancient criteria of salubrity and should not be presented as a current drinking-water testing protocol.

Chapter 5

[1] Nunc de perductionibus ad habitationes moeniaque, ut fieri oporteat, explicabo. Cuius ratio est prima perlibratio. Libratur autem dioptris aut libris aquariis aut chorobate, sed diligentius efficitur per chorobaten, quod dioptrae libraeque fallunt. Chorobates autem est regula longa circiter pedum viginti. Ea habet ancones in capitibus extremis aequali modo perfectos inque regulae capitibus ad normam coagmentatos, et inter regulam et ancones a cardinibus compacta transversaria, quae habent lineas ad perpendiculum recte descriptas pendentiaque ex regula perpendicula in singulis partibus singula, quae, cum regula est conlocata, aeque, tangendo aeque ac pariter lineas descriptionis, indicant libratam conlocationem.

[1] Now I will explain the measurements to be made for dwellings and walls, as they should be. The reason for this is the first balancing. It is balanced with diopters or water scales or a chorobate, but it is more carefully done with a chorobate, because diopters and scales are misleading. A chorobate is a rule about twenty feet long. It has ancones at the extreme ends, equally perfect, and cemented together according to the rule's heads, and between the rule and the ancones are transverse hinges, which have lines correctly described perpendicularly and hanging from the rule perpendicularly in each part, which, when the rule is placed, those that touch the lines of description equally and equally indicate a balanced placement.

[2] Sin autem ventus interpellaverit et motionibus lineae non potuerint certam significationem facere, tunc habeat in superiore parte canalem longum pedes V, latum digitum, altum sesquidigitum, eoque aqua infundatur, et si aequaliter aqua canalis summa labra tanget, scietur esse libratum. item eo chorobate cum perlibratum ita fuerit, scietur, quantum habuerit fastigii.

[2] But if the wind has interrupted it and the movements of the lines cannot make a certain sign, then let it have in the upper part a channel five feet long, a finger wide, and a half-finger deep, and water be poured into it, and if the water touches the upper lip of the channel evenly, it

will be known that it is level. Thus, when the chorobate has been leveled in this way, it will be known how much height it has.

[3] Fortasse, qui Archimedis libros legit, dicet non posse fieri veram ex aqua librationem, quod ei placet aquam non esse libratam, sed sphaeroides habere schema et ibi habere centrum, quo loci habet orbis terrarum. Hoc autem, sive plana est aqua seu sphaeroides, necesse est: <ad> extrema capita dextra ac sinistra, cum librata regula erit pariter sustinere regulam aquam; sin autem proclinatum habuerit regulae canalem erit ex una parte, quae erit altior, non in summis labris aqua. Necesse est enim, quocumque aqua sit infusa, in medio inflationem curvaturamque habere, sed capita dextra ac sinistra inter se librata esse. Exemplar autem chorobati erit in extremo volumine descriptum. Et si erit fastigium magnum, facilior erit decursus aquae; sin autem intervalla erunt lacunosa, substructionibus erit succurrendum.

[3] Perhaps someone who reads Archimedes' books will say that true balance cannot be achieved from water, because he likes the water not to be balanced, but to have a spheroidal scheme, but to have a center there, where the world has its place. Now, whether the water is flat or spheroidal, this is necessary: <to> the extreme heads of the rule should equally support the water of the rule; but if it is inclined on one side, which will be higher, the channel of the rule will not have water on the upper lips. For it is necessary, wherever the water is poured, to have swelling and curvature in the middle, but that the heads on the right and left should be balanced with each other. Now the model of the chorobate will be described in the outer volume. And if there is a large peak, the flow of the water will be easier; but if the intervals are gaping, assistance will have to be provided by substructures.

Explanatory note — Bk. 8.5 (leveling and the chorobates). To carry water at the correct fall, Vitruvius sets out the three methods of leveling —dioptrae, librae aquariae, and the chorobates— and prefers the last. The chorobates is a straight-edge some twenty feet long with legs and cross-braces; from these hang plumb-lines (perpendicula) that, coinciding with the marked lines, give the horizontal. But if the wind disturbs the plumb-lines, a water-channel cut in the upper face (some five feet long) is used: the water level then marks the horizontal

plane. Vitruvius even anticipates the objection —'someone who has read the books of Archimedes will say that a true level cannot be had from water' — and answers it from practice. On this leveling the minimum fall of the channel is fixed: half a foot per hundred (in centenos pedes semipede), that is, 1:200 or 0.5%. The text has been collated with no variant affecting the sense.

Comparative note — Bk. 8.5–8.6 (leveling and gradient). In the Budé, Book VIII is the work of Louis Callebat (1973), whose commentary reconstructs the chorobates and discusses its real precision. A. T. Hodge (Roman Aqueducts and Water Supply, 1992) argued that the chorobates was in truth a builder's level, not a surveyor's instrument capable of the very fine gradients (down to 1:20,000) of some aqueducts, and that Vitruvius misunderstood his Greek source. A point for the apparatus: all manuscripts of Vitruvius read semipede (half a foot per hundred), against the sicilici of Pliny's —a famous discrepancy between the two authors, not an internal variant. Granger (Loeb), Rowland–Howe (Cambridge, 1999), and Corso–Romano collate the technical vocabulary (perpendiculum, canalis, libramentum). This edition keeps semipede with the tradition and translates in its own voice.

Critical and instrumental note — VIII.5. The chorobates is an approximately twenty-foot leveling instrument using plumb lines and an upper water channel when wind interferes. Dioptra, libra aquaria, perpendiculum, norma and fastigium retain their technical identities. The discussion of the water surface and the spherical Earth is attributed to ancient physics and Vitruvius's reference to Archimedes; it is not silently replaced with a modern surveyor's specification.

Chapter 6

[1] Ductus autem aquae fiunt generibus tribus: rivis per canales structiles, aut fistulis plumbeis, seu tubulis fictilibus. Quorum hae sunt rationes. Si canalibus, ut structura fiat quam solidissima, solumque rivi libramenta habeat fastigata ne minus in centenos pedes sicilico eaeque structurae confornicentur, ut minime sol aquam tangat. Cumque venerit ad moenia, efficiatur castellum et castello coniunctum ad recipiendam aquam triplex inmissarium, conlocenturque in castello tres fistulae aequaliter divisae intra receptacula coniuncta, uti, cum abundaverit ab extremis, in medium receptaculum redundet.

Archaeological note — Bk. 8.6 (the Roman aqueducts). The chapter on conduits is illuminated by the archaeology of the greatest hydraulic system of antiquity. Rome came to have eleven aqueducts: the first was the Aqua Appia (312 BCE, of Appius Claudius the Blind), mostly underground; there followed the Anio Vetus, the Aqua Marcia (144 BCE) —the longest and famed for its purity— the Aqua Claudia and the Anio Novus, whose arches still cross the Roman campagna. The chief ancient source is the De aquaeductu of Sextus Julius Frontinus, curator aquarum under Nerva and Trajan, half a century after Vitruvius. The three methods Vitruvius describes are verified in the remains: masonry channels (specus) in the great aqueducts, lead pipes (fistulae, stamped by the plumbarius) in the urban distribution, and terracotta pipes. Surviving monuments such as the Pont du Gard (Nîmes) and the aqueduct of Segovia, and the network of Ostia, confirm the gentle gradient and the engineering that Book VIII theorizes.

[1] Water is conveyed in three ways: in masonry channels, through lead pipes, or through earthenware pipes. The arrangements are as follows. Where channels are used, make the masonry as solid as possible and give the channel bed a fall of at least one sicilicus for every hundred feet. Vault the channel so that sunlight reaches the water as little as possible. When the conduit reaches the city walls, construct a distribution reservoir with a connected three-part receiving basin. Fit three pipes in the reservoir,

dividing them equally among the connected compartments, so that surplus water from the two outer compartments overflows into the central one.

[2] Ita in medio ponentur fistulae in omnes lacus et salientes, ex altero in balneas vectigal quotannis populo praestent, ex quibus tertio in domus privatas, ne desit in publico; non enim poterint avertere, cum habuerint a capitibus proprias ductiones. Haec autem quare divisa constituerim, hae sunt causae, uti qui privatim ducent in domos vectigalibus tueantur per publicanos aquarum ductus.

[2] Thus pipes will be placed in the middle for all the lakes and springs, from one they will pay a yearly tax to the people for the baths, from which a third will go to private houses, so that there will be no shortage in the public; for they will not be able to divert it, since they will have their own conduits from the capitals. But the reasons why I have made these divisions are these, so that those who conduct water privately into their houses may be protected by the publicans by means of surveillance.

[3] Sin autem medii montes erunt inter moenia et caput fontis, sic erit faciendum, uti specus fodiantur sub terra librenturque ad fastigium, quod supra scriptum est. Et si tofus erit aut saxum, in suo sibi canalis excidatur, sin autem terrenum aut harenosum erit, solum et parietes cum camara in specu struantur et ita perducatur. Puteique ita sint facti, uti inter duos sit actus.

[3] But if there are mountains between the walls and the head of the spring, it will be necessary to do this, that caves be dug underground and leveled to the summit, as written above. And if it is tofu or rock, a channel should be cut out in its own right, but if it is earth or sandy, the soil and walls with a chamber should be built in the cave and so brought in. And the wells should be made so that there is a passage between the two.

[4] Sin autem fistulis plumbeis ducetur, primum castellum ad caput struatur, deinde ad copiam aquae lumen fistularum constituatur, eaeque fistulae ⟨e⟩ castello conlocentur ad castellum, quod erit in moenibus. Fistulae ne minus longae pedum denûm fundantur. Quae si centenariae erunt, pondus habeant in singulas pondo MCC; si

octogenariae, pondo DCCCCLX; si quinquagenariae, pondo DC; quadragenariae pondo CCCCLXXX; tricenariae pondo CCCLX; vicenariae pondo CCXL; quinûm denûm pondo CLXXX; denûm pondo CXX; octonûm pondo C; quinariae pondo LX. E latitudine autem lamnarum, quot digitos habuerint, antequam in rotundationem flectantur, magnitudinum ita nomina concipiunt fistulae. Namque quae lamna fuerit digitorum quinquaginta, cum fistula perficietur ex ea lamna vocabitur quinquagenaria similiterque reliquae.

4. If the water is to be conveyed in lead pipes, first build a reservoir at the source and determine the bore of the pipes according to the volume of water. Lay them from this reservoir to the distribution tank within the city walls. Cast each pipe at least ten feet long. A hundred-finger pipe should weigh 1,200 Roman pounds; an eighty-finger pipe, 960; a fifty-finger pipe, 600; a forty-finger pipe, 480; a thirty-finger pipe, 360; a twenty-finger pipe, 240; a fifteen-finger pipe, 180; a ten-finger pipe, 120; an eight-finger pipe, 100; and a five-finger pipe, 60. The names of the sizes derive from the width, measured in fingers, of the lead sheets before they are bent into a cylinder. Thus a pipe made from a sheet fifty fingers wide is called a fifty-finger pipe, and the other sizes are named in the same way.

[5] Ea autem ductio, quae per fistulas plumbeas est futura, hanc habebit expeditionem. Quodsi caput habeat libramenta ad moenia montesque medii non fuerint altiores, ut possint interpellare, sed intervalla, necesse est substruere ad libramenta, quemadmodum in rivis et canalibus. Sin autem non longa erit circumitio, circumductionibus, sin autem valles erunt perpetuae, in declinato loco cursus dirigentur. Cum venerint ad imum, non alte substruitur, ut sit libramentum quam longissimum; hoc autem erit venter, quod Graeci appellant κοιλίαν. Deinde cum venerit adversus clivum, ex longo spatio ventris leniter tumescit; ⟨ut⟩ exprimatur in altitudinem summi clivi.

A water supply carried through lead pipes should be arranged as follows. If the source stands high enough above the city and no intervening mountains rise high enough to obstruct the route, but only valleys intervene, build supports to

maintain the gradient, as with open channels and conduits. A short detour may instead be taken around them. Where valleys extend too far for this, direct the pipes down the slope. At the bottom provide low supports to form the longest possible level reach: this is the venter, called κοιλία in Greek. On meeting the opposite slope, the pipe rises gently from that long level reach, allowing the water to be forced up to the summit.

[6] Quodsi non venter in vallibus factus fuerit nec substructum ad libram factum, sed geniculus erit, erumpet et dissolvet fistularum commissuras. Etiam in ventre colliquiaria sunt facienda, per quae vis spiritus relaxetur. Ita per fistulas plumbeas aquam qui ducent, his rationibus bellissime poterunt efficere, quod et decursus et circumductiones et ventres et expressus hac ratione possunt fieri, cum habebunt a capitibus ad moenia fastigii libramenta.

If no venter is provided in the valley and the pipe is not supported on a level base, but instead turns through an abrupt elbow, the pressure will burst the pipe joints. Colliquiaria must also be provided in the venter to relieve the force of the air. With these arrangements, a supply through lead pipes can be carried successfully down slopes, around detours, through low level reaches and up rising sections, provided that the necessary difference in level is maintained between the source and the city.

[7] Item inter actus ducentos non est inutile castella conlocari, ut, si quando vitium aliqui locus fecerit, non totum omneque opus contundatur et, in quibus locis sit factum, facilius inveniatur; sed ea castella neque in decursu neque in ventris planitia neque in expressionibus neque omnino in vallibus, sed in perpetua ⟨fiant⟩ aequalitate.

It is also useful to place tanks at intervals of two hundred actus, so that, if a fault occurs at any point, the entire installation need not be dismantled and the damaged section can be located more easily. These tanks should stand on continuously level ground, not on descents, along the level bottom of a siphon, on rising sections or anywhere in valleys.

[8] Sin autem minore sumptu voluerimus, sic est faciendum. Tubuli crasso corio ne minus duorum digitorum fiant, sed ita hi tubuli ex una parte sint lingulati, ut alius in alium inire convenireque possint. coagmenta autem eorum calce viva

ex oleo subacta sunt inlinienda, et in declinationibus libramenti ventris lapis est ex saxo rubro in ipso geniculo conlocandus isque perterebratus, uti ex decursu tubulus novissimus in lapide coagmentetur et primus ex librati ventris; ad eundem modum adversum clivum et novissimus librati ventris in cavo saxi rubri haereat et primus expressionis ad eundem modum coagmentetur.

If a less costly method is preferred, make earthenware pipes with walls at least two fingers thick. Give each pipe a projecting tongue at one end so that it fits into the next. Coat their joints with quicklime worked with oil. At the bend where the descending line meets the level section of the siphon, place a bored block of red stone into which the last pipe of the descent and the first pipe of the level section are jointed. At the opposite rise, join the last pipe of the level section and the first rising pipe in the same way in a bored block of red stone.

[9] Ita librata planitia tubulorum ad decursus et expressiones non extolletur. Namque vehemens spiritus in aquae ductione solet nasci, ita ut etiam saxa perrumpat, nisi primum leniter et parce a capite aqua inmittatur et in geniculis aut versuris alligationibus aut pondere saburra contineatur. Reliqua omnia uti fistulis plumbeis ita sunt conlocanda. Item cum primo aqua a capite inmittitur, ante favilla inmittetur, uti coagmenta, si qua sunt non satis oblita, favilla oblinantur.

[9] Thus the level of the tubes, when leveled, should not be exaggerated for the purpose of running and expressing. For a strong spirit is wont to arise in the conveyance of water, so that it even breaks through rocks, unless first the water is let in gently and sparingly from the head, and the ballast is held in place by means of ligatures or sluices, or by weight. All the rest should be placed in the same way as lead pipes. Likewise, when the water is first let in from the head, ashes should be let in first, so that the agglomerations, if any, are not sufficiently removed, are covered with ashes.

[10] Habent autem tubulorum ductiones ea commoda. Primum in opere quod si quod vitium factum fuerit, quilibet id potest reficere. Etiamque multo salubrior est ex tubulis aqua quam per fistulas, quod plumbum videtur esse ideo vitiosum, quod ex eo cerussa nascitur; haec autem dicitur esse nocens corporibus humanis. Ita quod ex eo

procreatur, <si> id est vitiosum, non est dubium, quin ipsum quoque non sit salubre.

Earthenware conduits have these advantages. First, if a fault occurs during use, anyone can repair it. Moreover, water conveyed through earthenware is much more wholesome than water carried through lead pipes. Lead is considered harmful because white lead is produced from it, and white lead is said to injure the human body. If what is produced from lead is harmful, there can be no doubt that lead itself is unwholesome.

[11] Exemplar autem ab artificibus plumbariis possumus accipere, quod palloribus occupatos habent corporis colores. Namque cum fundendo plumbum flatur, vapor ex eo insidens corporis artus et in diem exurens eripit ex membris eorum sanguinis virtutes. Itaque minime fistulis plumbeis aqua duci videtur, si volumus eam habere salubrem. Saporemque meliorem ex tubulis esse cotidianus potest indicare victus, quod omnes, et structas cum habeant vasorum argenteorum mensas, tamen propter saporis integritatem fictilibus utuntur.

The pallor of lead-workers provides an example. When lead is melted, the vapor it gives off settles on the limbs and, progressively burning them, deprives the blood of its vitality. If we wish our water to be wholesome, therefore, it should certainly not be conveyed through lead pipes. Everyday practice also shows that water tastes better from earthenware: even people whose tables are furnished with silver vessels use pottery to preserve the purity of its taste.

Explanatory note — Bk. 8.6 (pipes and the toxicity of lead). Vitruvius distinguishes three ways of conveying water: by masonry channels (rivi), by lead pipes (fistulae plumbeae), and by earthenware pipes (tubuli fictiles). He describes the making of the fistulae by the plumbarii from rolled sheets of standard size, named by their weight. And he reaches a decisive passage (8.6.10-11): water is more wholesome through earthenware than through lead, 'for from it cerussa (white lead) is produced, which is said to be harmful to the human body.' He adds the empirical proof: plumbers are pallid, because the vapor of molten lead destroys the vigor of the blood. It is one of the earliest testimonies to an awareness of lead toxicity (plumbism). The text has been collated with no variant affecting the sense.

Comparative note — Bk. 8.6 (lead and health). Callebat's Budé (1973) comments on the passage alongside Pliny (Natural History 31.57-58 and 34.164) and Frontinus (De aquaeductu), who likewise treat the fistulae and the plumbarii. Granger (Loeb) and Rowland–Howe (Cambridge, 1999) stress Vitruvius's lucidity and its limit (despite the warning, he went on designing conduits with lead). A. T. Hodge's study ('Vitruvius, Lead Pipes and Lead Poisoning,' American Journal of Archaeology, 1981) qualified the real extent of the risk (continuous flow, protective calcareous scale); recent archaeometry (Delile et al., PNAS, 2014) measured in the Tiber sediments lead up to a hundred times that of the springs. This edition keeps the transmitted text and translates in its own voice, with no variant affecting the sense.

[12] Sin autem fontes, ⟨non sunt⟩ unde ductiones aquarum, faciamus, necesse est puteos fodere. In puteorum autem fossionibus non est contemnenda ratio, sed acuminibus sollertiaque magna naturales rerum rationes considerandae, quod habet multa variaque terra in se genera. Est enim uti reliquae res ex quattuor principiis composita. Et primum est ipsa terrena; habetque ex umore aquae fontes; item calores, unde etiam sulphur, alumen, bitumen nascitur; aerisque spiritus inmanes, qui, cum graves per intervenia fistulosa terrae perveniunt ad fossionem puteorum et ibi homines offendunt fodientes, vi naturali vaporis obturant eorum naribus spiritus animales; ita, qui non celerius inde effugiunt, ibi interimuntur.

[12] If there are no springs from which we can bring in water, wells must be dug. Their excavation demands careful judgment: the natural properties of the ground must be considered with considerable skill and ingenuity, since the earth contains many different substances. Like everything else, it is composed of four elements. First comes earth itself; it also contains springs arising from watery moisture, heat from which sulfur, alum, and bitumen are produced, and powerful currents of air. When these heavy exhalations pass through the earth's tubular openings into a well shaft and encounter the diggers, the force of the vapor obstructs their breathing. Anyone who fails to escape quickly is killed there.

[13] Hoc autem quibus rationibus caveatur, sic erit faciendum. Lucerna accensa demittatur; quae si permanserit ardens, sine periculo descendetur. Sin autem eripietur lumen a vi vaporis, tunc secundum puteum dextra ac sinistra defodiantur aestuaria; ita quemadmodum per nares spiritus ex aestu <ariis> dissipabuntur. Cum haec sic explicata fuerint et ad aquam erit perventum, tunc saepiatur as⟨sa⟩ structura, ne obturentur venae.

The following precautions are prescribed. Lower a lit lamp into the well; if it continues to burn, a person may descend without danger. If the vapor extinguishes the flame, dig ventilation shafts to the right and left beside the well, so that the air can escape through them as through nostrils. Once these arrangements have been made and water has been reached, line the well with open-jointed masonry so that the water-bearing veins are not blocked.

[14] Sin autem loca dura erunt aut nimium venae penitus fuerint, tunc signinis operibus ex tectis aut superioribus locis excipiendae sunt copiae. In signinis autem operibus haec sunt facienda. Uti harena primum purissima asperrimaque paretur, caementum de silice frangatur ne gravius quam librarium, calx quam vehementissima mortario mixta, ita ut quinque partes harenae ad duas respondeant. Eorum fossa ad libramentum altitudinis, quod est futurum, calcetur vectibus ligneis ferratis.

[14] If the ground is hard or the water-bearing veins lie too deep, collect supplies from roofs or higher ground in cisterns built in opus signinum. Prepare very clean, coarse sand, and break flint into pieces weighing no more than a pound each. Mix very strong lime in the mixing vessel, using five parts sand to two of lime. Ram the material into the trenches to the intended wall height with iron-shod wooden rammers.

[15] Parietibus calcatis, in medio quod erit terrenum, exinaniatur ad libramentum infimum parietum. Hoc exaequato solum calcetur ad crassitudinem, quae constituta fuerit. Ea autem si duplicia aut triplicia facta fuerint, uti percolationibus transmutari possint, multo salubriorem [et suaviorem] aquae usum efficient; limus enim cum

habuerit, quo subsidat, limpidior fiet et sine odoribus conservabit saporem. Si non, salem addi necesse erit et extenuari.

[15] After the walls have been rammed, remove the earth between them down to their lowest level. Level the bottom and ram the floor to the prescribed thickness. Two or three connected cisterns, allowing water to pass through successive stages of filtration, make the supply much healthier [and sweeter]. When the silt has somewhere to settle, the water becomes clearer and retains its taste without an offensive smell. Otherwise, salt must be added to refine it.

Quae potui de aquae virtute et varietate, quasque habeat utilitates quibusque rationibus ducatur et probetur, in hoc volumine posui; de gnomonicis vero rebus et horologiorum rationibus insequenti perscribam.

I have set out in this volume what I could about the power and variety of water, what uses it has, and by what arguments it is drawn and proved; but I will write about the gnomonic matters of clocks in the following volume.

Textual note — Book VIII. The Latin is checked against Krohn (1912), with the Spanish authorial interpretation guiding the English. The argument distinguishes the search for water, its supposed natural properties, empirical tests, leveling and the construction of conduits. Ancient explanations of salubrity and therapeutic effects are preserved as historical claims. Uncertain gradients and pipe dimensions are not silently replaced with a single modern engineering specification.

What I knew about the power and variety of water, and what advantages it has, and by what means it can all be extracted and tested, I have put in this volume; Next I will write about the gnomonic questions of clocks.

Critical and engineering note — VIII.6. The text distinguishes constructed channels, lead pipes and earthenware tubes. The opening gradient is textually difficult, especially around sicilicus and differently supplied words. The apparatus retains the ancient reading instead of fabricating a uniquely certain metric slope. Pipe sizes, distribution, pressure effects and the relation between level and fall require separate consideration; a plausible hydraulic reconstruction does not, by itself, establish a manuscript reading.

M. VITRVVIVS POLLIO · DE ARCHITECTVRA · LIBER IX

ARGUMENTUM LIBRI IX — *On gnomonics and astronomy: the doubling of the square handed down by Plato and the right-angled triangle of Pythagoras; the discovery of Archimedes concerning the adulterated crown; the course of the sun through the twelve signs of the zodiac, the northern and southern constellations and the doctrine of the astrologers; and the analemma, the construction of sundials, and the water-clocks (clepsydrae) of Ctesibius.*

Notice. — *Book IX turns to gnomonics and astronomy. Its preface, a meditation on the immortality of learning above athletic fame, is among the most quoted in the treatise. The book expounds the geometry of the heavens, the zodiac and the courses of sun, moon and planets, the phases and the analemma, and the construction of sundials and water-clocks. It preserves much Hellenistic astronomical lore and is the principal Latin source for ancient dialling.*

Preface

[1] Nobilibus athletis, qui Olympia, Pythia Isthmia, Nemea vicissent, Graecorum maiores ita magnos honores constituerunt, uti non modo in conventu stantes cum palma et corona ferant laudes, sed etiam, cum revertantur in suas civitates cum victoria, triumphantes quadrigis in moenia et in patrias invehantur e reque publica perpetua vita constitutis vectigalibus fruantur. Cum ergo id animadvertam, admiror, quid ita non scriptoribus eidem honores etiamque maiores sint tributi, qui infinitas utilitates aevo perpetuo omnibus gentibus praestant. Id enim magis erat institui dignum, quod athletae sua corpora exercitationibus efficiunt fortiora, scriptores non solum suos sensus, sed etiam omnium, <cum> libris ad discendum et animos exacuendos praeparant praecepta.

[1] The Greeks established such great honors for the noble athletes who had won Olympia, Isthmia, and Nemea, that they should not only stand in the assembly and bear praise with a palm and a crown, but also, when they returned to their cities with victory, be carried triumphantly in chariots into the walls and into their homelands, and enjoy the fruits established by the state for life. Therefore, when I observe this, I wonder

why even greater honors should not be paid to writers, who have provided infinite benefits to all nations throughout all ages. For it was more worthy of being established that athletes make their bodies stronger by exercise, writers prepare not only their own senses, but also the precepts of all, <with> books for learning and sharpening the minds.

[2] Quid enim Milo Crotoniates, quod fuit invictus, prodest hominibus aut ceteri, qui eo genere fuerunt victores, nisi quod, dum vixerunt ipsi, inter suos cives habuerunt nobilitatem. Pythagorae vero praecepta, Democriti, Platonis, Aristotelis ceterorumque sapientium cotidiana perpetuis industriis culta non solum suis civibus, sed etiam omnibus gentibus recentes et floridos edunt fructus. E quibus qui a teneris aetatibus doctrinarum abundantia satiantur, optimos habent sapientiae sensus, instituunt civitatibus humanitatis mores, aequa iura, leges, quibus absentibus nulla potest esse civitas incolumis.

[2] For what does Milo of Croton, who was undefeated, do to men or to others who were victors of that kind, except that, while they lived, they enjoyed nobility among their citizens? But the precepts of Pythagoras, the daily cultivation of Democritus, Plato, Aristotle, and other wise men by the constant industry, bear fresh and flourishing fruits not only to their own citizens, but also to all nations. From which those who are satisfied from an early age with the abundance of learning, have the best of wise sense, and establish in their cities the morals of humanity, just rights, and laws, without which no city can be safe.[161]

What use was Milo of Croton, who was invincible, to men or others of his kind who were conquerors, except that, while they lived, they enjoyed nobility among their citizens? But the precepts of Pythagoras, Democritus, Plato, Aristotle, and other sages, cultivated by daily and perpetual labor not only by their own citizens but also by all nations, bear fresh and flourishing fruit. Of these, those who are satisfied with an abundance of knowledge from a tender

161 Χειρόκμητα] The title associated with Democritus has a complex textual history. Krohn's Vitruvian text prints χειρουμμετων; the form Χειρόκμητα draws on the parallel tradition and philological correction (compare Pliny, Natural History 24.160, and Diogenes Laertius 9.49). Χειρόκμητα is adopted here as an editorially normalized form, with that status made explicit.

age possess the best of wise senses and establish for states humane manners, equal rights, and laws, without which no state can be secure.

[3] Cum ergo tanta munera ab scriptorum prudentia privatim publiceque fuerint hominibus praeparata, non solum arbitror palmas et coronas his tribui oportere, sed etiam decerni triumphos et inter deorum sedes eos dedicandos iudicari.

[3] Therefore, since such great gifts have been prepared for men by the prudence of writers, both privately and publicly, I think that not only should palms and crowns be awarded to them, but also that triumphs should be decreed and that they should be judged by being dedicated among the seats of the gods.

Since so many gifts have been prepared for mankind, in private and in public, by the foresight of writers, I think that not only should palms and crowns be awarded to them, but that triumphs should be decreed for them and seats among the gods appointed for them.

Eorum autem cogitata utiliter hominibus ad vitam explicandam e pluribus singula paucorum uti exempla ponam, quae recognoscentes necessario his tribui honores oportere homines confitebuntur.

But I will use their thoughts as examples of a few out of many, useful to men in explaining life, which, recognizing, men will admit that honors must necessarily be attributed to them.

But I will use examples from their thoughts to explain their lives for the benefit of men, among the many individuals of a few, whom men, recognizing that they necessarily need honors for this tribe, will confess.

[4] Et primum Platonis e multis ratiocinationibus utilissimis unam, quemadmodum ab eo explicata sit, ponam. Locus aut ager paribus lateribus si erit quadratus eumque oportuerit duplicare, quod opus fuerit genere numeri, quod multiplicationibus non invenitur, eo descriptionibus linearum emendatius reperitur. Est autem eius rei haec demonstratio. Quadratus locus, qui erit longus et latus pedes denos, efficit areae pedes C. Si ergo opus fuerit eum duplicare, id est pedum CC, item e paribus lateribus facere, quaerendum erit, quam magnum latus eius quadrati fiat, ut ex eo CC pedes duplicationibus areae respondeant.

Id autem numero nemo potest invenire. Namque si XIIII constituentur, erunt multiplicati pedes CXCVI, si XV, pedes CCXXV.

[4] First I shall set out one of Plato's many valuable demonstrations, as he himself expounded it. If a place or field is square, with equal sides, and it must be doubled, this cannot be achieved by any number through multiplication, but is obtained instead by the correct drawing of lines. And this is a demonstration of this. A square place, which is ten feet long and ten feet wide, makes an area of 100 feet. Therefore, if it is necessary to double it, to make it 200 feet, and also with equal sides, it will be necessary to find how large the side of its square is made, so that from it 200 feet correspond to the doublings of the area. But no one can find this numerically. For if 14 are formed, the multiplied feet will be 196, if 15, 225 feet.

Plato's many useful arguments, I will set forth one, just as he explained it. If a place or a field of equal sides is a square and it is necessary to double it, what is required of the kind of number, which is not obtained by multiplication, is obtained by the improved descriptions of the lines. Now, this is a demonstration of his point. A square room, which will be ten feet long and ten feet on each side, makes an area of 100 square feet. Therefore, if it is necessary to double it, to 200 square feet, and to make it also of equal sides, it will be necessary to find out how large the side of the square will be, so that from it, 200 feet will correspond to the doubling of the area. But no one can find that number. Because if 14 are placed, it will be multiplied by 195 feet, if there are 15, 225 feet.

5. Ergo quoniam id non explicatur numero, in eo quadrato, longo et lato pedes X quod fuerit, linea ab angulo ad angulum diagonios perducatur, uti dividantur duo trigona aequa magnitudine, singula areae pedum quinquagenûm, ad eiusque lineae diagonalis longitudinem locus quadratus paribus lateribus describatur. Ita quam magna duo trigona in minore quadrato quinquagenûm pedum linea diagonio fuerint designata, eadem magnitudine et eodem pedum numero quattuor in maiore erunt effecta. Hac ratione duplicatio grammicis rationibus ab Platone, uti schema subscriptum est in ima pagina, explicata est.

Since the result cannot be expressed as a whole-number measure, draw a diagonal from corner to corner of the square ten feet long and ten feet wide. This divides it into two equal triangles, each of fifty square feet. Construct a square with equal sides on the length of that diagonal. The smaller square contains two triangles of fifty square feet; the larger contains four of the same size and area. Plato thus explained the doubling by geometrical construction, as shown in the diagram drawn at the foot of the page.

Therefore, since this cannot be explained by number, in that square, which was 10 feet long and 10 feet wide, a diagonal line is drawn from corner to corner, to divide two triangles of equal size, each with an area of fifty square feet, and along its diagonal an equal square described by the sides. Thus, as the two large triangles were drawn in the smaller square of fifty feet by the diagonal line, four of the same size and the same number of feet will be made in the larger one. In this way, on the lower page, the duplication of Plato's grammatical rules is explained, as the scheme is signed.

[6] Item Pythagoras normam sine artificis fabricationibus inventam ostendit, et quod magno labore fabri normam facientes vix ad verum perducere possunt, id rationibus et methodis emendatum ex eius praeceptis explicatur. Namque si sumantur regulae tres, e quibus una sit pedes III, altera pedes IIII, tertia pedes V, eaeque regulae inter se compositae tangant alia aliam suis cacuminibus extremis schema habentes trigoni, deformabunt normam emendatam. Ad eas autem regularum singularum longitudines si singula quadrata paribus lateribus describantur, quod erit trium latus, areae habebit pedes VIIII, quod IIII, XVI quod V erit, XXV.

Pythagoras also showed how to construct a right angle without relying on a craftsman's square. His principles provide by reason and method the accuracy that craftsmen can scarcely achieve even with great labor. Take three rules, three, four and five feet long, and join their ends to form a triangle: they will define an accurate right angle. If a square is drawn on each rule, the square on the three-foot side has an area of nine square feet, that on the four-foot side sixteen, and that on the five-foot side twenty-five.

Explanatory note — Bk. 9, preface (Pythagoras and the 3-4-5 triangle). Before Archimedes's crown, the preface to Book IX recalls another capital

discovery: Pythagoras showed how to obtain a right angle without the craftsman's square (norma). Three rules of 3, 4, and 5 feet, joined at their tips into a triangle, suffice: the angle formed by the sides of 3 and 4 is a right angle. And the squares built on them confirm it: 9 + 16 = 25. Vitruvius thus describes the 3-4-5 triangle —far less than the general theorem that posterity would call 'Pythagorean'— and is one of its most cited ancient sources. He adds that Pythagoras, believing himself aided by the Muses, offered them a sacrifice in gratitude. The application is architectural: the setting-out of stairs (klimakter) and of right angles on site. The text has been collated with no variant affecting the sense.

Comparative note — Bk. 9, preface (the Pythagorean triangle). In the Budé, Book IX is the work of Jean Soubiran (1969). Granger (Loeb) and Rowland–Howe (Cambridge, 1999) stress that Vitruvius describes the 3-4-5 right triangle, not the general proof of the theorem (Heath, A History of Greek Mathematics, I, 1921); the attribution to Pythagoras is traditional and disputed, since Pythagorean triples already appear on the Babylonian tablet Plimpton 322 (c. 1800 BCE). On the sacrifice, the tradition (Cicero, Diogenes Laertius, Plutarch) wavers between the hecatomb of oxen and skepticism, given Pythagorean vegetarianism. Corso–Romano fix the vocabulary (norma, trigonum). This edition keeps the transmitted text and translates in its own voice, with no variant affecting the sense.

Likewise, Pythagoras shows that the rule was found without the invention of craftsmen, and how with much labor the craftsmen who make it can hardly keep it true. For if three rules are taken, one of which measures 3 feet, another 4 feet, and the third 5 feet, and these rules, combined together, touch, having at their ends the shape of a triangle, they distort the corrected standard. And for these regular lengths, if each square is described with equal sides, when it has three sides, the area will be 81 feet, which will be 44, 16, which will be 5, and 25.

[7] Ita quantum areae pedum numerum duo quadrata ex tribus pedibus longitudinis laterum et quattuor efficiunt, aeque tantum numerum reddit id unum ex quinque descriptum. Id Pythagoras cum invenisset, non dubitans a Musis se in ea inventione monitum,

maximas gratias agens hostias dicitur his immolavisse. Ea autem ratio, quemadmodum in multis rebus et mensuris est utilis, etiam in aedificiis scalarum aedificationibus, uti temperatas habeant graduum librationes, est expedita.

The combined area of the squares on the three-foot and four-foot sides therefore equals the area of the square on the five-foot side. When Pythagoras discovered this, he believed that the Muses had guided him and is said to have offered sacrifices to them in gratitude. The same principle is useful in many calculations and measurements, and also in setting out staircases so that their steps have a convenient inclination.

Thus, just as two square feet of three-foot sides and four feet in length equal the area in feet, the same number is yielded by one of the five described. When Pythagoras discovered this, without doubting that the Muses had admonished him for this discovery, it is said that he offered them sacrifices, giving them his greatest thanks. And this system, being useful in many things and measurements, is also convenient in the construction of stairs, so that they may have the temperature of the degrees of equilibrium.

[8] Si enim altitudo contignationis ab summa coaxatione ad imum libramentum divisa fuerit in partes tres, erit earum quinque in scalis scaporum iusta longitudine inclinatio. ⟨quare⟩ Quam magnae fuerint inter contignationem et imum libramentum altitudinis partes tres, quattuor a perpendiculo recedant et ibi conlocentur inferiores calces scaporum. Ita si erunt temperatae; ⟨libratae⟩ et graduum ipsarum scalarum erunt conlocationes. Item eius rei erit subscripta forma.

[8] For if the height of the floor from the highest point to the lowest platform is divided into three parts, five of them will be the right length of inclination in the ladders of the rungs. However great the three parts of the height between the floor and the lowest platform, four will recede from the perpendicular and there the lower steps of the rungs will be placed. Thus they will be moderate; and the placements of the steps themselves will be. Likewise the form of this matter will be as follows.

For if the height of the floor from the upper level to the lower level has been divided into three parts, five of them will be inclined along the stairwells. However great the height between the floor and the bottom of the balance, three

pieces must be removed, four from the vertical, and there the lower gears of the axles will be placed. Thus they will be tempered; and there will be placements of the steps of the stairs themselves. The signed form of the thing will also be there.

[9] Archimedis vero cum multa miranda inventa et varia fuerint, ex omnibus etiam infinita sollertia id, quod exponam, videtur esse expressum. nimirum Hiero enim Syracusis auctus regia potestate, rebus bene gestis cum auream coronam votivam diis inmortalibus in quodam fano constituisset ponendam, manupretio locavit faciendam et aurum ad sacomam adpendit redemptori. Is ad tempus opus manu factum subtiliter regi adprobavit et ad sacomam pondus coronae visus est praestitisse.

Among Archimedes's many remarkable inventions, the one I shall now describe seems to show extraordinary ingenuity. When Hiero had acquired royal power at Syracuse and his affairs had prospered, he decided to dedicate a golden crown to the immortal gods in a temple. He contracted for its manufacture and weighed out the gold to the craftsman on a balance. The completed work was presented to the king at the appointed time, delicately finished, and the crown appeared to match the weight of gold supplied.[162]

As for Archimedes, although his discoveries and inventions are many and admirable, the one I am about to relate seems to have been conceived with boundless intelligence and ingenuity. King Hiero of Syracuse, after having attained royal power, decided to offer a votive crown of gold to the immortal gods in a certain temple in gratitude for his successes; he ordered that it be made with a specific weight of gold and gave the goldsmith the exact amount. The goldsmith presented it to the king at the appointed time, with exquisite craftsmanship, and the weight of the crown turned out to be exactly that of the gold delivered. But then a rumour arrived that he had stolen some of the gold, replacing it with an equal weight of silver. Indignant that he had been deceived, but unable to find a way to prove the fraud, Hiero asked Archimedes to take on the problem. Critical note. [The "Nimium Hiero" in the manuscript should be

162εὕρηκα εὕρηκα] Vitruvius transmits the exclamation in Greek in the account of Archimedes (9, preface 10–11 in this edition's numbering). Krohn (1912) prints the Greek words. Their accents are normalized here; they are not presented as a modern conjecture replacing a Latin transliteration in the manuscripts.

read as "Namque Hiero"; the particle nimium is not textual but a corruption of the scribe; cf. Krohn, 1912, 225; De architectura 9, praef. 9 – 12; Rowland and Howe, 1999, 108; debate on the physical plausibility of the method: see Stein, 1999]

[10] Posteaquam indicium est factum dempto auro tantundem argenti in id coronarium opus admixtum esse, indignatus Hiero se contemptum esse neque inveniens, qua ratione id furtum reprehenderet, rogavit Archimeden, uti in se sumeret sibi de eo cogitationem. Tunc is, cum haberet eius rei curam, casu venit in balineum, ibique cum in solium descenderet, animadvertit, quantum corporis sui in eo insideret, tantum aquae extra solium effluere. idque cum eius rei rationem explicationis ostendisset, non est moratus, sed exsiluit gaudio motus de solio et nudus vadens domum ⟨uni⟩versis significabat clara voce invenisse, quod quaereret; nam currens identidem graece clamabat: εὕρηκα, εὕρηκα.

Later it was reported that some gold had been removed and an equal weight of silver mixed into the crown. Indignant at the deception, but unable to find a way of exposing the theft, Hiero asked Archimedes to investigate. While considering the problem, Archimedes happened to enter a bath. As he lowered himself into the tub, he noticed that the water flowing over its edge corresponded to the volume of his body submerged in it. Realizing that this suggested a way to solve the problem, he immediately leapt from the tub in delight and went home naked, proclaiming aloud that he had found what he sought. As he ran he repeatedly cried in Greek, εὕρηκα, εὕρηκα, "I have found it, I have found it".

After it was reported that so much silver had been stolen from the gold, Hiero, indignant at having been scorned, and finding no reason to blame theft, asked Archimedes to take charge of the matter. Then, while he was engaged in the question, he happened to go into the bath, and there, as he lay down on the couch, he noticed that although his body was seated upon it, so much water came out of the couch. And so, when he had shown the reason for the explanation of the matter, he did not linger, but leaped joyfully from his throne, and returning home naked, made it more truly clear in a plain voice that he had found what he was looking for; because while running he repeatedly

shouted in Greek: «εὕρηκα, εὕρηκα» (that is: « I have found it, I have found it! »).

Explanatory note — Bk. 9, preface (Archimedes and the crown). The preface to Book IX contrasts the fleeting fame of athletes with the lasting glory of the learned, and issues in the most famous anecdote of ancient science. Hiero II of Syracuse, suspecting that the goldsmith had abstracted gold from a votive crown and replaced it with silver without altering the weight, commissions Archimedes to detect the fraud. On entering the bath, Archimedes observes that the water overflows in proportion to the body immersed: he thus grasps that he can measure the volume of an irregular body by the water it displaces. He runs out naked, crying in Greek 'heureka, heureka' ('I have found it!'). Then, with two masses of equal weight —one of gold, one of silver— and the crown, he measures the water displaced by each and, by comparison, reveals the admixture of silver. Vitruvius is the oldest ancient source for this story (some two centuries after the event); Archimedes himself does not record it, and the exact method — simple immersion or hydrostatic weighing— is debated. The text has been collated with no variant affecting the sense.

Comparative note — Bk. 9, preface (Hiero's crown). In the Budé, Book IX is the work of Jean Soubiran (1969), whose astronomical and mathematical commentary is standard. Granger (Loeb) and Rowland–Howe (Cambridge, 1999) stress that the anecdote does not appear in Archimedes's surviving works (On Floating Bodies sets out the principle, not the episode) and that its technical plausibility has been questioned: the precision required by mere immersion is difficult, so it has been proposed that Archimedes in fact used hydrostatic weighing —a hypothesis already framed by Galileo in La Bilancetta (1586) and revisited by modern scholarship (Ch. Rorres). Corso–Romano fix the vocabulary (massa, coronarium opus). This edition keeps the transmitted text and translates in its own voice, with no variant affecting the sense.

[11] Tum vero ex eo inventionis ingressu duas fecisse dicitur massas aequo pondere, quo etiam fuerat corona, unam ex auro et alteram ex argento. Cum ita fecisset, vas amplum ad summa labra implevit aquae, in quo demisit argenteam massam. Cuius quanta magnitudo in vasum depressa est, tantum aquae effluxit. Ita exempta massa quanto minus factum fuerat, refudit sextario mensus, ut eodem modo, quo prius

fuerat, ad labra aequaretur. Ita ex eo invenit, quantum pondus argenti ad certam aquae mensuram responderet.

Following this discovery, he is said to have made two masses equal in weight to the crown, one of gold and the other of silver. He filled a large vessel to its brim with water and lowered the silver mass into it. The water that overflowed corresponded to the volume of the immersed mass. After removing it, he measured in sextarii the water needed to restore the former level at the brim. In this way he established how a given weight of silver corresponded to a particular volume of water.

It is said that from that discovery he made two masses of equal weight, one of gold and the other of silver. When he had done so, he filled a large vessel to the brim with water, into which he dropped the mass of silver. The amount of water that flowed into the vessel was [missing information]. Releasing the mass, since it had been made less than it should have been, he poured out a measure of six-quarters, so that, in the same way as before, it was equal to [missing information]. Thus he discovered how much a certain weight of silver corresponded to a certain measure of water.

[12] Cum id expertus esset, tum auream massam similiter pleno vaso demisit et ea exempta, eadem ratione mensura addita invenit ex aquae numero sextantum: minore quanto minus magno corpore eodem pondere auri massa esset quam argenti. Postea vero repleto vaso in eadem aqua ipsa corona demissa invenit plus aquae defluxisse in corona quam in aurea eodem pondere massa, et ita ex eo, quod fuerat plus aquae in corona quam in massa, ratiocinatus reprehendit argenti in auro mixtionem et manifestum furtum redemptoris.

He then lowered the gold mass into the full vessel and, after removing it, measured in the same way how much water was needed to refill it. The quantity was smaller: at equal weight, gold occupied less volume than silver. Finally he refilled the vessel and immersed the crown itself. More water overflowed than when the equal weight of gold had been immersed. From this greater displacement he demonstrated the mixture of silver with the gold and exposed the craftsman's theft.

Having experienced this, he also placed a mass of gold in a vessel filled with it, and having emptied it, found that the measure added for the same reason

was not so much due to the quantity of water: the smaller the body, the less water there was, and the mass of gold would be of the same weight as that of silver. However, afterwards, when the vessel was filled with the same amount of water, he lowered the crown and discovered that more water had entered the crown than the mass of gold of the same weight, from which he deduced that there was more water in the crown than in the mass, and criticized the melting of silver into gold and the manifest theft of the contractor.

[13] Transferatur mens ad Archytae Tarentini et Eratosthenis Cyrenaei cogitata; hi enim multa et grata a mathematicis rebus hominibus invenerunt. Itaque cum in ceteris inventionibus fuerint grati, in eius rei cogitationibus maxime sunt suspecti. Alius enim alia ratione explicaverunt, quod Delo imperaverat responsis Apollo, uti arae eius, quantum haberent pedum quadratorum, id duplicarentur, et ita fore uti, qui essent in ea insula, tunc religione liberarentur.

Let us turn to the discoveries of Archytas of Tarentum and Eratosthenes of Cyrene, who made many contributions in mathematics of benefit to humanity. Their other inventions earned them gratitude, but they are held in particular esteem for their treatment of the following problem. Each explained in a different way how to carry out Apollo's command, given by an oracle at Delos, that his altars should be doubled in size, and how the people of the island might thus be released from their religious obligation.

Let us now turn our attention to the speculations of Archytas of Tarentum and Eratosthenes of Cyrene, for they revealed to humankind many things pleasing to mathematics. And although they were esteemed for their other discoveries, they are most admired for their solution to this problem. Each explained it in a different way, in reference to what Apollo had prescribed through his oracle to the inhabitants of Delos: that they should double their altar while preserving its shape — that is, the number of square feet — so that they might be freed from the evil that afflicted them.

[14] Itaque Archytas cylindrorum descriptionibus, Eratosthenes organica mesolabi ratione idem explicaverunt. Cum haec sint tam magnis doctrinarum iucunditatibus animadversa et cogamur naturaliter inventionibus singularum rerum considerantes effectus moveri, multas res attendens admiror etiam

Democriti de rerum natura volumina et eius commentarium, quod inscribitur Χειροκμήτων; †in quo etiam utebatur anulo signaretur amolcie est expertus†.

Archytas explained the problem by constructions involving cylinders, and Eratosthenes by the mechanical method of the mesolabe. Such achievements reveal the great pleasures of learning, and reflection on the effects of individual discoveries naturally moves us to admiration. Among many other works, I also admire Democritus's writings on nature and his treatise entitled Χειροκμήτων. [The following clause, which refers to the use of a ring, is corrupt in the adopted Latin text and cannot be translated securely.]

Thus, Archytas resolved it by describing semicylinders, and Eratosthenes by the mechanical procedure of the mesolabium. Having observed these things with such great delight in the doctrine, and moved by nature to consider the effects of each discovery, in examining so many subjects I also admire the volumes of Democritus on the nature of things and his commentary entitled Cheirokmita, in which, moreover, he sealed with his ring, on soft wax, that which he had verified experimentally.

[15] Ergo eorum virorum cogitata non solum ad mores corrigendos, sed etiam ad omnium utilitatem perpetuo sunt praeparata, athletarum autem nobilitates brevi spatio cum suis corporibus senescunt; [itaque neque cum maxime sunt] florentes neque posteritati hi, quemadmodum sapientium cogitata hominum vitae, prodesse possunt.

The discoveries of these men are therefore directed not only towards improving conduct but also towards the lasting benefit of everyone. The renown of athletes, by contrast, ages quickly with their bodies. [Thus, even when at the height of their powers,] they cannot benefit posterity as the discoveries of the wise benefit human life.

The speculations of such men are laid up forever, no longer for a single enterprise but for the benefit of all; whereas the renown of athletes ages in a short time along with their own bodies, so that neither in their fullest splendour nor for posterity can they be of profit, as the reflections of the wise are profitable to human life.

[16] Cum vero neque moribus neque institutis scriptorum praestantibus tribuantur honores, ipsae autem per se mentes aeris altiora prospicientes memoriarum gradibus ad caelum elatae aevo

inmortali non modo sententias sed etiam figuras eorum posteris cogunt esse notas. Itaque, qui litterarum iucunditatibus instinctas habent mentes, non possunt non in suis pectoribus dedicatum habere, sicuti deorum, sic Ennii poetae simulacrum; Accii autem carminibus qui studiose delectantur, non modo verborum virtutes sed etiam figuram eius videntur secum habere praesentem esse.

[16] But since honors are not bestowed on the excellent character or institution of writers, but their minds themselves, looking higher than the air, and raised to the heavens by the steps of their memories, compel posterity to know not only their opinions but also their figures. Therefore, those whose minds are innately inclined to the delights of literature cannot help but have in their hearts, as in the case of the gods, the image of the poet Ennis; while those who delight in the study of Accius' poems seem to have present with them not only the virtues of words but also his figure.

And even if no honors are paid to the customs or teachings of eminent writers, their very minds, which alone contemplate the highest realms, raised to heaven by the degrees of memory, ensure that not only their thoughts but also their faces are known to posterity throughout the immortal ages. Therefore, those whose spirits are captivated by the delight of literature cannot help but keep the image of the poet Ennius consecrated in their hearts, like that of the gods; and those who delight in the verses of Accius believe they have present not only the vigor of his words but even his very likeness.

[17] Item plures post nostram memoriam nascentes cum Lucretio videbuntur velut coram de rerum natura disputare, de arte vero rhetorica cum Cicerone, multi posterorum cum Varrone conferent sermonem de lingua latina, non minus etiam plures philologi cum Graecorum sapientibus multa deliberantes secretos cum his videbuntur habere sermones, et ad summam sapientium scriptorum sententiae corporibus absentibus vetustate florentes cum insunt inter consilia et disputationes, maiores habent, quam praesentium sunt, auctoritates omnes.

[17] Likewise, many who were born after our memory will be seen to be discussing with Lucretius, as if in person, about the nature of things, and

with Cicero, about the art of rhetoric; many of posterity will converse with Varro about the Latin language; no less will many philologists be seen to be deliberating much with the wise Greeks, having secret conversations with them; and, to sum up, the opinions of wise writers, absent from their bodies, flourishing in antiquity, when they are present in the midst of counsels and discussions, have all greater authority than those of the present.

Likewise, many of those born after our memory will be seen debating with Lucretius, as if face to face, on the nature of things, and on the art of rhetoric with Cicero; many of posterity will confer with Varro a discourse on the Latin language, and no less will philologists be seen with the Greek sages deliberating with them many secrets for having speeches, and in the highest degree the opinions of wise writers, lacking flourishing bodies in old age, when they are in the midst of councils and debates, have greater authority than those present.

[18] Itaque, Caesar, his auctoribus fretus sensibus eorum adhibitis et consiliis ea volumina conscripsi, et prioribus septem de aedificiis, octavo de aquis, in hoc de gnomonicis rationibus, quemadmodum de radiis solis in mundo sunt per umbras gnomonis inventae quibusque rationibus dilatentur aut contrahantur, explicabo.

Relying on these authors, Caesar, and drawing on their ideas and counsel, I have written these books. In the first seven I treated buildings, in the eighth water, and in this one I shall explain gnomonics: how the Sun's rays are traced through the shadows of gnomons, and by what principles those shadows lengthen or shorten.

Therefore, Caesar, trusting in these authors, using his senses and using his plans, I wrote those volumes, and in the first seven on buildings, in the eighth on waters, in this one on gnomonic reasons, as well as the rays of the sun in the world are found through the shadows of the gnomon, and for what reasons they dilate or contract, I will explain to you.

Critical note — IX, preface. The mathematical and biographical exempla require a dense apparatus. The 3–4–5 triangle is explained as a practical right-angle construction. The story of Hiero's crown and Archimedes is preserved as Vitruvius's narrative, with modern reconstructions of the experiment

distinguished from the ancient testimony. Greek exclamations are not labeled conjectural merely because they are normalized typographically.

Chapter 1

[1] Ea autem sunt divina mente comparata habentque admirationem magnam considerantibus, quod umbra gnomonis aequinoctialis alia magnitudine est Athenis, alia Alexandriae, alia Romae, non eadem Placentiae ceterisque orbis terrarum locis. Itaque longe aliter distant descriptiones horologiorum locorum mutationibus. Umbrarum enim aequinoctialium magnitudinibus designantur analemmatorum formae, e quibus perficiuntur ad rationem locorum et umbrae gnomonum horarum descriptiones. ἀνάλημμα est ratio conquisita solis cursu et umbrae crescentis ad brumam observatione inventa, e qua per rationes architectonicas circinique descriptiones est inventus effectus in mundo.

[1] These things are ordained by the divine mind and excite great wonder in those who consider that the shadow of the equinoctial gnomon is of one size in Athens, another in Alexandria, another in Rome, not the same in Placentia and other parts of the world. Therefore, they differ greatly from the descriptions of the clocks of places. For the sizes of the equinoctial shadows are designated by the forms of the analemmas, from which the descriptions of the places and the shadows of the gnomons of the hours are completed according to the ratio. ἀνάλημμα is a ratio acquired by observing the course of the sun and the shadow growing towards winter, from which the effect in the world is found by architectonic ratios and descriptions of the compass.[163]

But they compare themselves to the divine mind, and are greatly surprised to find that the shadow of the equinoctial gnomon is of different sizes in Athens, Alexandria, Rome, and not the same in Piacenza and the rest of the world. Therefore, the description of sundials is quite different from local variations. For the magnitudes of the equinoctial shadows determine the shapes of the analemmas, from which the descriptions of the locations and shadows of the hour gnomons are derived. The analemma is a system discovered by

163ἀνάλημμα] The Greek form is supplied editorially where the running Latin text gives analemma in Latin letters. This is a technical term of gnomonics, denoting the geometrical projection used in the construction of sundials.

observing the course of the sun and the rising shadow of the mist, from which, through architectural methods and descriptions of the surroundings, the effect on the world is found.

[2] Mundus autem est omnium naturae rerum conceptio summa caelumque sideribus et stellarum cursibus conformatum. Id volvitur continenter circum terram atque mare per axis cardines extremos. Namque in his locis naturalis potestas ita architectata est conlocavitque cardines tamquam centra, unum a terra inmani ⟨spatio⟩ in summo mundo ac post ipsas stellas septentrionum, alterum trans contra sub terra in meridianis partibus, ibique circum eos cardines orbiculos circum centra uti in torno perfecit, qui graece πόλοι nominantur, per quos pervolitat sempiterno caelum. Ita media terra cum mari centri loco naturaliter est conlocata.

[2] Now the world is the conception of all things in nature, the highest heaven and the stars formed. It revolves continuously around the earth and the sea by the extreme pivots of the axis. For in these places the natural power has been architected and placed pivots as centers, one from the earth in the highest world and behind the very stars of the north, the other on the other side under the earth in the southern parts, and there around those pivots it has completed small orbs around the centers as in a wheel, which in Greek are called poles, through which the eternal heaven flies. Thus the earth is naturally placed in the middle with the sea as the center.

Now, the world is the highest conception of all things in nature, and the heavens are formed by the stars. These revolve continually around the earth and the sea by means of the extreme hinges of the axis. For in these places the natural power thus constructed itself, and placed the hinges as centers, one on the earth before the upper world and behind the northern stars, the other on the opposite side beneath the earth in the southern parts; these are called apses, through which the eternal heaven flies. Thus, Middle-earth is naturally situated in the center of the sea.

3. His natura dispositis ita, uti septentrionali parte a terra excelsius habeat altitudinem centrum, in meridiana autem parte in inferioribus locis subiectum a terra obscuretur, tunc etiam per medium

transversa et inclinata in meridiem [circuli de] lata zona XII signis est conformata. Eorum species stellis dispositis XII partibus peraequatis exprimit depictam ab natura figurationem. Itaque lucentia cum mundo reliquisque sideribus ornatu circum terram mareque pervolantia cursus perficiunt ad caeli rotunditatem.

[3] These are so arranged by nature that on the northern side the center has a height higher than the earth, on the southern side it is obscured by the earth in lower places, then also through the middle a zone transverse and inclined to the south of the circle is brought in twelve signs and shaped. Which appearance of them expresses the figure depicted by nature with the stars arranged in twelve equal parts. Therefore, shining with the world and the other stars, flying around the earth and sea in their adornment, they complete their courses to the roundness of the sky.

These are arranged by nature in such a way that in the northern part the center of height must be higher than the ground, and in the southern part, in the lowest places, the subject must be darker from the ground; then also through the transverse and southward-sloping middle of the circle, it brought a zone of twelve signs and was conformed. The appearance of its stars, arranged in 12 equal parts, expresses the configuration represented by nature. And thus the light, adorned with the world and the other stars, completes its flight around the earth and the sea to the roundness of the sky.

[4] Omnia autem visitata et invisitata temporum necessitate sunt constituta. Ex quis sex signa numero supra terram cum caelo pervagantur, cetera sub terram subeuntia ab eius umbra obscurantur. Sex autem ex his semper supra terram nituntur. Quanta pars enim novissimi signi depressione coacta versatione subiens sub terram occultatur, tantundem eius contraria e conversationis necessitate suppressa rotatione circumacta trans locis patentibus ex obscuris egreditur ad lucem; namque vis una et necessitas utrimque simul orientem et occidentem perficit.

[4] But all things visited and unvisited are established by the necessity of time. Of which six signs in number wander above the earth with the sky, the rest are obscured by its shadow, coming under the earth. But six of

these are always founded above the earth. For as much of the last sign is hidden under the earth by depression, forced by its turning, so much of its opposite, by the necessity of its conversation, suppressed by rotation, goes out from the dark places to the light; for one force and necessity perfects both east and west at the same time.

But all that is visited and unvisited is determined by the necessity of the times. Of whom six signs wander above the earth with the sky, the others that descend below the earth are obscured by their shadow. But six of them always rest upon the ground. For just as a part of the last sign is hidden beneath the earth by the depression forced by the revolution, so too its opposite, suppressed by the necessity of communication and surrounded by the rotation through the open spaces, emerges from darkness into light. For a force and a necessity from both sides complete the east and the west.

[5] Ea autem signa cum sint numero XII partesque duodecumas singula possideant mundi versenturque ab oriente ad occidentem continenter, tunc per ea signa contrario cursu luna, stella Mercurii, Veneris, ipse sol itemque Martis et Iovis et Saturni ut per graduum ascensionem percurrentes alius alia circumitionis magnitudine ab occidente ad orientem in mundo pervagantur. Luna die octavo et vicesimo et amplius circiter hora caeli circumitionem percurrens, ex quo signo coeperit ire, ad id signum revertendo perficit lunarem mensem.

[5] Now since the signs are twelve in number and each occupies a twelfth part of the world and moves continuously from east to west, then through those signs the moon, the stars Mercury, Venus, the sun itself, as well as Mars, Jupiter and Saturn, travel in the opposite direction, as if by ascending degrees, each with a different magnitude of circuit from west to east, and they wander through the world. On the twenty-eighth day and more, the moon, having completed a circuit of the heavens for about an hour, from which it began to go, returns to that sign and completes the lunar month.

But since these signs are twelve in number and each possesses one-twelfth of the world, and are continually rotated from east to west, then through these signs the moon, the stars of Mercury, Venus, the sun itself, and also Mars, Jupiter, and Saturn, as they pass through the degrees of ascent, one after the other, vary

in size from west to east in the world. On the twenty-eighth day, and for about an hour more, the moon, passing through the circuit of the sky from the sign from which it began to emerge, returns to that sign and completes the lunar month.

[6] Sol autem signi spatium, quod est duodecuma pars mundi, mense vertente vadens transit; ita XII mensibus XII signorum intervalla pervagando cum redit ad id signum, unde coeperit, perficit spatium vertentis anni. Ex eo, quem circulum luna terdecies in XII mensibus percurrit, eum sol eisdem mensibus semel permetitur. Mercurii autem et Veneris stellae circa solis radios uti per centrum eum itineribus coronantes regressus retrorsus et retardationes faciunt, etiam stationibus propter eam circinationem morantur in spatiis signorum.

[6] Now the sun passes through the space of a sign, which is the twelfth part of the world, as it moves through the space of a month; thus, in twelve months, by wandering through the intervals of twelve signs, when it returns to the sign from which it began, it completes the space of a year. Of that which the moon traverses thirteen times in twelve months, the sun is permitted to pass through that circle once in the same months. But the stars of Mercury and Venus, as they circle the rays of the sun through the center, make a backward and retarded return, and even at stations, because of that circumambulation, they remain in the spaces of the signs.

Now, the sun traverses the space of the sign, which is the twelfth part of the world, completing a cycle in a month; thus, in 12 months, passing through the intervals of 12 signs, when it returns to the sign from which it began, it completes the space of the year of change. Of the circle that the moon traverses thirteen times in twelve months, the sun traverses it once in the same number of months. But the stars of Mercury and Venus, using the sun's rays, make their retrograde and decelerated journeys through the center of the sun, and they too remain in seasons due to their rotation within the spaces of the signs.

[7] Id autem ita esse maxime cognoscitur ex Veneris stella, quod ea, cum solem sequatur, post occasum eius apparens in caelo clarissimeque lucens vesperugo vocitatur, aliis autem temporibus eum antecurrens et

oriens ante lucem lucifer appellatur. Ex eoque nonnumquam plures dies in ⟨uno⟩ signo commorantur, alias celerius ingrediuntur in alterum signum. Itaque quod non aeque peragunt numerum dierum in singulis signis, quantum sunt moratae prius, transiliendo celerioribus itineribus perficiunt [iustum cursum. Ita efficitur], uti, quod demorentur in nonnullis signis, nihilominus, cum eripiant se ab necessitate morae, celeriter consequantur iustam circumitionem.

[7] This is especially evident from the star Venus, which, when it follows the sun, appears in the sky after its setting and shines most brightly, and is called the evening star, but at other times, when it precedes it and rises before dawn, it is called the morning star. From this it sometimes remains in a sign for several days, at other times it enters another sign more quickly. Therefore, since they do not complete the same number of days in each sign as they have previously spent, they complete [the correct course] by skipping over it in more rapid courses. This is done so that, although they remain in some signs, nevertheless, when they escape the necessity of delay, they quickly complete their correct circuit.

That this is so is best known from the star Venus, which, when it follows the sun, appears after its setting in the sky and shines most brightly at nightfall, is called Lucifer, but at other times precedes it and rises at dawn. From here, sometimes several days pass in one sign, and at other times they enter another sign more quickly. Therefore, by not completing the same number of days in each of the signs, however long they may have lingered before, they complete the correct course by skipping faster routes. Thus it is done, so that they linger in some signs; however, when they are freed from the need for delay, they quickly achieve a proper circumambulation.

***[8]** Iter autem in mundo Mercurii stella ita pervolitat, uti trecentesimo et sexagensimo die per signorum spatia currens perveniat ad id signum, ex quo priore circumlatione coepit facere cursum, et ita peraequatur eius iter ut circiter tricenos dies in singulis signis habeat numeri rationem.*

[8] The journey of the star Mercury in the world is such that on the three hundred and sixty-sixth day, running through the spaces of the signs, it reaches the sign from which it began its course in the previous circulation, and its journey is so equalized that it has about thirty days in each sign.

And the course of the star Mercury through the world is so swift that on the three-hundred-and-sixtieth day, as it traverses the spaces of the signs, it arrives at the sign from which it began its circuit in the previous revolution; and its course is completed in such a way that it spends about thirty days in each of the signs.

[9] *Veneris autem, cum est liberata ab inpeditione radiorum solis, XXX diebus percurrit signi spatium. quod minus quadragenos dies in singulis signis patitur, cum stationem fecerit, restituit eam summam numeri in uno signo morata. Ergo totam circinationem in caelo quadringentesimo et octogensimo et quinto die permensa iterum init signum, ex quo signo prius iter facere coepit.*

9. When Venus is free from the obstruction of the Sun's rays, she passes through a sign in thirty days. Whatever falls short of forty days in each sign is made up when she remains stationary in one of them. Having thus completed the whole circuit of the heavens on the four hundred and eighty-fifth day, she returns to the sign from which her previous course began.

But on Friday, when it is freed from the influence of the sun's rays, it travels the distance of the sign in 30 days. The minus forty days it spends in each sign, when it has made a station, it adds back to the sum of the days spent in a sign. Therefore, on the forty-eightieth day, and on the fifth day, the entire circuit of the sky was measured again in that sign, from where the previous sign had begun its journey.

[10] Martis vero circiter sexcentesimo octogensimo tertio siderum spatia pervagando pervenit eo, ex quo initium faciendo cursum fecerat ante, et in quibus signis celerius percurrit, cum stationem fecit, explet dierum numeri rationem. Iovis autem placidioribus gradibus scandens contra mundi versationem, circiter CCCLX diebus singula signa permetitur, et consistit post annum XI et dies CCCXIII et redit in id signum, in quo ante XII annos fuerat. Saturni vero, mensibus undetriginta et amplius paucis diebus pervadens per signi spatium, anno nono et vicensimo et circiter diebus CLX, in quo ante tricensimo fuerat anno, in id restituitur, ex eoque, quo minus ab extremo distat mundo, tanto maiorem circinationem rotae percurrendo tardior videtur esse.

10. Mars travels through the zodiac and returns to the point from which its previous course began in about 683 days; where it passes through a sign more rapidly, its stationary period makes up the required number of days. Jupiter advances more slowly against the rotation of the heavens, taking about 360 days to pass through each sign. After eleven years and 313 days it returns to the sign it occupied nearly twelve years earlier. Saturn takes twenty-nine months and a few additional days to cross a sign, returning in twenty-nine years and about 160 days to the sign it occupied nearly thirty years before. Being nearer the outermost part of the universe, it travels a larger circuit and therefore appears slower.

But on Tuesday, around the six hundred and eighty-third star day, it reached the place from which it had previously begun its journey, and in whose signs it traveled most rapidly; when it made a station, it completed the number of days. Jupiter, on the other hand, ascending in gentler steps against the direction of the world, spends about 360 days in each sign, and stops after 11 years and 333 days, and returns to the sign in which it had been 12 years before. But Saturn, having passed through the space of the sign for ninety months and some days more, in the year twenty-nine and about one hundred and sixty days, in which it had been in the year thirtieth, is restored to that place, and from there, the less distant from the end of the world, the more slowly it seems to traverse the greater circumference of the wheel.

Textual and historical note — IX.1.9–10. The planetary periods are translated as given in the adopted ancient text. Mars's 683 is a number of days, not a calendar year; Saturn's passage through a sign takes twenty-nine months, whereas its circuit is given as twenty-nine years and about 160 days. These figures should not be substituted for modern astronomical periods.

[11] *Ei autem, qui supra solis iter circinationes peragunt, maxime cum in trigono fuerint, quod is inierit, tum non progrediuntur, sed regressus facientes morantur doneque cum idem sol de eo trigono in aliud signum transitionem fecerit. Id autem nonnullis sic fieri placet, quod aiunt solem, cum longius absit abstantia quadam, non lucidis itineribus errantia per ea sidera obscuritatis morationibus inpedire. Nobis vero id non videtur. Solis enim splendor perspicibilis et patens sine ullis obscurationibus est per omnem mundum, ut etiam nobis appareant, cum faciant eae stellae regressus et morationes. Ergo si tantis*

intervallis nostra species potest id animadvertere, quid ita divinitatibus splendoribusque astrorum iudicamus obscuritates obici posse?

[11] But those who make their rounds above the sun's path, especially when they are in a trine that it has entered, then they do not advance, but make returns and remain, and finally when the same sun has made a transition from that trine to another sign. But some people like to do this in this way, which they say that the sun, when it is farther away by a certain absence, does not hinder the stars wandering through it on their bright paths with delays of darkness. But to us this does not seem to be the case. For the brightness of the sun is perceptible and open without any obscurations throughout the whole world, so that it also appears to us when those stars make returns and stays. Therefore, if our species can observe this at such intervals, why do we judge that the divinations and splendors of the stars can be so much objected to as obscurity?

But those who practice circumcision above the course of the sun, especially when they are in the trine it enters, do not advance then, but retreat and remain until the sun itself has made the transition from that trine to another sign. But some like it done this way, because they say that the sun, when it is farther away at a certain distance, does not hinder the wandering of those stars with bright journeys through the chambers of darkness. But it does not seem so to us. For the brightness of the sun is transparent and open without any obscuration throughout the world, so that even when those stars make their retreats and abodes they appear to us, they do not appear. Therefore, if our species can perceive this at such great distances, why do we judge that darkness can be objected to by the divinization and the brightness of the stars?

[12] *Ergo potius ea ratio nobis constabit, quod, fervor quemadmodum omnes res evocat et ad se ducit, ut etiam fructus e terra surgentes in altitudinem per calorem videmus, non minus aquae vapores a fontibus ad nubes per arcus excitari, eadem ratione solis impetus vehemens radiis trigoni forma porrectis insequentes stellas ad se perducit et ante currentes veluti refrenando retinendoque non patitur progredi, sed ad se regredi, in alterius trigoni signum esse.*

[12] Therefore, we will rather understand this reason, that just as heat evokes and draws all things to itself, as we also see fruits rising from the earth to a height through heat, and no less water vapors are raised from springs to the clouds by arcs, so by the same reason the vehement force of the sun, with its rays extended

in the form of a triangle, draws the following stars to itself, and as if restraining and holding them back, it does not allow them to advance, but to return to itself, being in the sign of another triangle.

Therefore, it will become clear to us why, just as heat evokes all things and draws them to itself, so too we see fruits rise from the earth to the heights through heat, and no less the vapors from the earth. Water rises from springs to the clouds by means of arcs; for the same reason, the sun 's attacks, with the powerful rays of the trine, draw the stars that follow it towards itself, and holding them back as if they were running ahead of it, prevents them from advancing, but makes them return to itself, becoming a sign of another trine.

[13] *Fortasse desiderabitur, quid ita sol quinto a se signo potius quam secundo aut tertio, quae sunt propiora, facit in his fervoribus retentiones. Ergo, quemadmodum id fieri videatur, exponam. Eius radii in mundo uti trigoni paribus lateribus formae lineationibus extenduntur. Id autem nec plus nec minus est ad quintum ab eo signo. Igitur si radii per omnem mundum fusi circinationibus vagarentur neque extentionibus porrecti ad trigoni formam linearentur, propiora flagrarent. Id autem etiam Euripides, Graecorum poeta, animadvertisse videtur. Ait enim, quae longius a sole essent, haec vehementius ardere, propiora vero eum temperata habere. Itaque scribit in fabula Phaethonte sic: καίει τὰ πόρρω, τἄγγυθεν δ' εὔκρατ' ἔχει.*

[13] Perhaps it will be wondered why the sun, in the fifth sign from itself rather than the second or third, which are nearer, causes retentions in these fervors. Therefore, I will explain how this seems to be done. Its rays in the world are extended in the form of a triangle with equal sides, by lines. But this is neither more nor less than the fifth sign from that sign. Therefore, if the rays were to wander through the whole world in circles, nor were they to be extended in the form of a triangle, by lines, the nearer things would burn. And Euripides, the Greek poet, seems to have noticed this also. For he says that those things which were farther from the sun burn more vehemently, but those which were nearer he keeps in moderation. Therefore he writes in the fable of Phaethon thus: καῖε τὰ πόρρω, τἀγγύθεν δ' εὔκρατ' ἔχει.[164]

164καῖε τὰ πόρρω, τἀγγύθεν δ' εὔκρατ' ἔχει] A verse of Euripides (Phaethon, fr. 771 Nauck), supplied here in Greek by reference to the fragment's parallel tradition. Editorial restitution is distinguished from the form transmitted in the Vitruvian witnesses.

Perhaps it is overlooked why the sun, in the fifth sign of itself, and not in the second or third, which are closer, makes these fervors. Therefore, I will explain how this seems to happen. Its rays extend over the world like a triangle with equal sides of the line of form. And this is neither more nor less than the fifth sign. Therefore, if the rays wandered around the world in circular motions and were not attracted by extensions to form a triangle, they would shine closer. Euripides, the Greek poet, also seems to have noticed this. For he said that things farther from the sun burned more violently, but those closer to it had a moderate temperature. And so he writes in the work of Phaethon the following: «καῖε τὰ πόρρω, τἀγγύθεν δ' εὔκρατ' ἔχει» (burn what is far away, but keep what is near warm).

[14] *Si ergo res et ratio et testimonium poetae veteris id ostendit, non puto aliter oportere iudicari, nisi quemadmodum de ea re supra scriptum habemus.*

[14] Therefore, if the fact and reason and the testimony of the ancient poet show this, I do not think it should be judged otherwise than in the way we have written about that matter above.

If, then, the substance, the reasoning, and the testimony of the old poet demonstrate this, I do not think it necessary to judge otherwise than as we have written on that matter above.

Iovis autem inter Martis et Saturni circinationem currens maiorem quam Mars, minorem quam Saturnus pervolat cursum. Item reliquae stellae, quo maiore absunt spatio ab extremo caelo proxumamque habent terrae circinationem, celerius ⟨pervagari⟩ videntur, quod quaecumque earum minorem circinationem peragens saepius subiens praeterit superiorem.

But Jupiter, running between the orbits of Mars and Saturn, flies through a course greater than that of Mars, but less than that of Saturn. Likewise, the other stars, the greater the distance they are from the extreme heaven and the closer their orbits to the earth, appear to be faster, because each of them, while making a smaller orbit, often passes the higher one.

Jupiter, which travels between Mars and Saturn, follows a path greater than that of Mars and less than that of Saturn. Likewise, the other stars, the farther they are from the outer sky and the closer they are to Earth, the faster they are seen, because any of them that follows a smaller orbit tends to pass by the highest one.

[15] Quemadmodum, si in rota, qua figuli utuntur, inpositae fuerint septem formicae canalesque totidem in rota facti sint circum centrum imo adcrescentes ad extremum, in quibus hae cogantur circinationem facere, verseturque rota in alteram partem, necesse erit eas contra rotae versationem nihilominus adversus itinera perficere, et quae proximum centrum habuerit, celerius pervagari, quaeque extremum orbem rotae peragat, etiamsi aeque celeriter ambulet, propter magnitudinem circinationis multo tardius perficere cursum: similiter astra nitentia contra mundi cursum suis itineribus perficiunt circumitum, sed caeli versatione redundationibus referuntur cotidiana temporis circumlatione.

[15] Just as if seven ants were placed on a wheel used by potters, and as many channels were made in the wheel around the center at the bottom, increasing towards the end, in which these are forced to make a circuit, and the wheel is turned in the other direction, it will be necessary for them to complete their journeys no less in opposition to the rotation of the wheel, and the one that has the nearest center will travel more quickly, and the one that completes the outer circle of the wheel, even if it walks equally quickly, will complete its course much more slowly because of the magnitude of the circuit: in the same way the shining stars complete their circuit in their journeys against the course of the world, but the rotation of the heavens is referred to by the daily circulation of time.

Similarly, if seven ants are placed on the potter's wheel, and as many channels are made on the wheel around the center at the bottom, increasing towards the end, in which these are forced to make a circle, and the wheel is turned to the other side, they will have to be used against the direction of the wheel no less to make journeys against it, and those that have the center closest travel more quickly, and those that complete the outermost circle of the wheel, although they walk with the same speed, due to the size of the circuit, complete their journey much more slowly.

[16] *Esse autem alias stellas temperatas, alias ferventes, etiamque frigidas haec esse causa videtur, quod omnis ignis in superiora loca habet scandentem flammam. Ergo sol aethera, qui est supra se, radiis exurens efficit candentem, in quibus locis habet cursum Martis stella; itaque fervens ab ardore solis efficitur. Saturni autem, quod est proxima extremo mundo tangit ⟨que⟩ congelatas caeli*

regiones; vehementer est frigida. Ex eo Iovis, cum inter utriusque circumitiones habeat cursum, a refrigeratione caloreque earum medio convenientes temperatissimosque habere videtur effectus.

[16] But the reason why there are other stars that are temperate, others that are boiling, and also that are cold seems to be that all fire has a flame that rises to higher places. Therefore the sun, burning the aether, which is above it, with its rays, has made it red-hot, in which places the star Mars has its course; therefore it is made hot by the heat of the sun. But Saturn, which is nearest to the outermost world, touches the frozen regions of the sky; it is extremely cold. Hence Jupiter, since it has its course between the orbits of both, seems to have effects that are appropriate and most temperate from the cooling and heat of them.

De zona XII signorum et septem astrorum contrario opere ac cursu, quibus rationibus et numeris transeunt e signis in signa, et circumitum eorum, uti a praeceptoribus accepi, exposui; nunc de crescenti lumine lunae deminutioneque, uti traditum est nobis a maioribus, dicam.

I have explained the zone of the twelve signs and the seven stars in their opposite work and course, by what reasons and numbers they pass from sign to sign, and their circuit, as I received it from my teachers; now I will speak of the waxing and waning of the moon's light, as handed down to us by our ancestors.

Now, this seems to be the reason why some stars are temperate, others hot, and still others cold, because all fire has a flame that rises to higher places. That is why the ethereal sun, which is above it, burning with its rays, made it shine in the places where the star Mars has its course; that is why the heat of the sun makes it boil. But Saturn, which is near the end of the world, touches the icy regions of the sky; it is very cold. Hence, Jupiter, when it has a course between the cycles of both, seems to have the most suitable and moderate effects of cooling and heating between them.

explained to them the area of the twelve signs and the seven stars, contrary to their work and course, by what proportions and numbers they pass from sign to sign, and their circuit, as I received from my teachers; Now I will speak of the waxing and waning of the moon's light, as our elders have transmitted it to us.

Critical and astronomical note — IX.1. Analemma denotes a geometrical construction dependent on latitude and the equinoctial shadow, not merely a diagram. Πόλοι denotes the poles of the celestial axis; a defective digital reading is not automatically a manuscript variant. Planetary stationes and regressus describe apparent retrograde motion in an ancient geocentric explanation. Vesperugo and Lucifer are evening and morning names for Venus, not separate bodies. Fidelity to the historical model and its modern scientific explanation remain distinct.

Chapter 2

[1] Berosus, qui ab Chaldaeorum civitate sive natione progressus in Asia etiam disciplinam Chaldaicam patefecit, ita est professus:

Pilam esse ex dimidia parte candentem, reliqua habere caeruleo colore. Cum autem cursum itineris sui peragens subierit sub orbem solis, tunc eam radiis et impetu caloris corripi convertique candentem propter eius proprietatem luminis ad lumen. Cum autem ea vocata ab solis orbi superiora spectent, tunc inferiorem partem eius, quod candens non sit, propter aeris similitudinem obscuram videri. Cum ad perpendiculum ea sit ad eius radios, totum lumen ad superiorem speciem retineri, et tunc eam vocari primam.

The ball is half glowing, the rest having a blue color. But when, completing the course of its journey, it descends under the sun's orbit, then it is caught by the rays and the force of heat and turns glowing because of its property of light to light. But when those called the sun's orbit are viewed from above, then its lower part, which is not glowing, appears dark because of its resemblance to air. Since it is perpendicular to its rays, the whole light is retained to its higher appearance, and then it is called the first.

Berosus, who, through the advancement of the city or nation of the Chaldeans in Asia, also revealed the Chaldean discipline, professes as follows:

The sphere must shine halfway, and the remainder must be blue. And when, in completing its course, it came under the orbit of the sun, then I rebuked it with rays and a burst of heat, and made it, resplendent, by its property of light, into light. But when those who are called to look upon the upper world of the sun, then the lower part of it, which does not shine, appears dark due to its resemblance to air. When it was at a right angle to its rays, all the light was retained for the higher species, and then it was called first.

[2] *Cum praeteriens vadat ad orientis caeli partes, relaxari ab impetu solis extremamque eius partem candentiae oppido quam tenui linea ad terram mittere splendorem, et ita ex eo eam secundam vocari. cotidiana autem versationis remissione tertiam, quartam in dies numerari. Septimo die, ⟨cum⟩ sol sit ad occidentem, [luna autem inter orientem et occidentem] medias caeli teneat regiones, quod dimidia parte caeli spatio distet a sole, item dimidiam candentiae conversam habere ad terram. Inter solem vero et lunam cum distet totum*

mundi spatium et lunae orienti sol trans contra sit ad occidentem, eam, quo longius absit, a radiis remissam XIIII die plena rota totius orbis mittere splendorem, reliquosque dies decrescentia cotidiana ad perfectionem lunaris mensis versationibus et cursu a sole revocationibus subire sub rotam radiosque eius et ita menstruas dierum efficere rationes.

[2] When passing by it goes to the eastern parts of the sky, it is relaxed from the force of the sun and the outer part of its brightness is as thin as a line to the earth, and so from that it is called the second. The daily rotation is reduced to the third, the fourth to the days. On the seventh day, the sun is to the west, [the moon between east and west] it occupies the middle regions of the sky, because it is distant from the sun by half the space of the sky, and also has half of its brightness turned towards the earth. But between the sun and the moon, since the whole space of the world is distant and the sun is on the other side of the moon to the west, it, the farther it burns, is relaxed from the rays and on the fourteenth day it sends out a full wheel of the whole world, and on the remaining days it decreases daily and the perfection of the lunar month by rotations and reversions from the sun, it undergoes under the wheel and its rays and now makes the monthly days.

When it passes and moves towards the eastern parts of the sky, it is relieved by the sun's glare, and the extreme part of its radiance sends a light to the city like a thin line towards the earth, and thus it is called the second. But with the remission of the daily cycle, the third and fourth are counted in the day. On the seventh day, the sun should be in the west, [and the moon between east and west] should occupy the middle regions of the sky, so that half of the space of the sky would be distant from the sun, and also half of the space of the sky would be far from the sun. Of its brightness must be directed towards the earth. Between the sun and the moon, when all the space of the world is far away, and the sun is opposite the moon in the west, the more it burns, leave it, free from the rays, on the 14th day send all the brilliance of the wheel of the whole world, and the remaining days decrease daily until completing the revolutions and the course of the lunar month to suffer the revocations of the sun under the wheel and its spokes, and now make the monthly accounts of the days.

[3] Uti autem Aristarchus Samius mathematicus vigore magno rationes varietatis disciplinis de eadem ⟨re⟩ reliquit, exponam. Non

enim latet lunam ⟨non⟩ suum propriumque habere lumen, sed esse uti speculum et ab solis impetu recipere splendorem. Namque luna de septem astris circulum proximum terrae in cursibus minimum pervagatur. Ita quot mensibus sub rotam solis radiosque uno die, antequam praeterit, latens obscuratur. Cum est cum sole, nova vocatur. Postero autem die, quo numeratur secunda, praeteriens ab sole visitationem facit tenuem extremae rotundationis. Cum triduum recessit ab sole, crescit et plus inluminatur. Cotidie vero discedens cum pervenit ad diem septimum, distans a sole occidente circiter medias caeli regiones, dimidia lucet, et eius quae ad solem pars spectat, ea est inluminata.

[3] But as Aristarchus the Samian mathematician has vigorously left reasons for the variety of disciplines concerning the same, I will explain. For it is not hidden that the moon does not have its own light, but is like a mirror and receives its brightness from the sun's impact. For the moon travels the nearest circle of the earth in the shortest of the seven stars. Thus, as many months pass under the wheel and rays of the sun, on one day, before it passes, it is hidden and darkened. When it is with the sun, it is called a new day. But on the next day, which is counted as the second, passing by the sun, it makes a thin visitation of extreme roundness. When it has been away from the sun for three days, it grows and becomes more illuminated. But descending daily, when it reaches the seventh day, distant from the sun in the west about half the regions of the sky, half the light, and that part of it which looks towards the sun is illuminated.

But Aristarchus of Samos, the mathematician, vigorously set aside the calculations of the various disciplines relating to the same thing, which I will explain. For it is not hidden that the moon has no light of its own, but serves as a mirror and receives its brightness from the sun. For the moon, of the seven stars, travels in trajectories the circle closest to the Earth. Thus, for how many months does it remain under the wheel of the sun's rays, and one day, before it passes, it is hidden and darkened. When it is with the sun, it is called a nova. And the following day, when the second is counted, the passage of the sun makes a thin visit to the extreme end of the round. When it has withdrawn from the sun for three days, it grows and receives more light. But descending each day, when

the seventh day arrives, about half of the regions of the sky, half of the light, is far from the sun in the west, and the part of it that faces the sun is illuminated.

[4] *Quarto autem decumo die, cum in diametro spatio totius mundi absit ab sole, perficitur plena et oritur, cum sol sit ad occidentem, ideo quod totum spatium mundi distans consistit contra et impetu solis totius orbis in se recipit splendorem. Septumo decumo die cum sol oriatur, ea pressa est ad occidentem. Vicensimo et altero die cum sol est exortus, luna tenet circiter caeli medias regiones, et id quod spectat ad solem, id habet lucidum reliquis obscura. Item cotidie cursum faciendo circiter octavo et vicensimo die subit sub radios solis, et ita menstruas perficit rationes.*

[4] But on the fourteenth day, when it is far from the sun in the diameter of the whole world, it is completed full and rises, since the sun is to the west, for this reason that the whole distant space of the world stands against it and receives the brightness of the whole world by the force of the sun. On the seventeenth day, when the sun rises, it is pressed to the west. On the twenty-second day, when the sun has risen, the moon occupies approximately the middle regions of the sky, and that which looks towards the sun has light, the rest is dark. Likewise, making its daily course, on about the twenty-eighth day it comes under the rays of the sun, and thus completes the monthly calculations.

Nunc, ut in singulis mensibus sol signa pervadens auget et minuit dierum et horarum spatia, dicam.

Now, as the sun, passing through the signs, increases and decreases the spaces of days and hours in each month, I will say.

And on the fourteenth day, when the entire world's diameter is at its greatest distance from the sun, it is fully completed and rises, when the sun is in the west, so that the entire world's distance is against it and it receives the sun's brightness from the entire world. On the seventeenth day, when the sun rises, it presses westward. On the twenty-second day, when the sun has risen, the moon occupies the middle regions of the sky, and the part facing the sun is illuminated, while the rest is dark. Likewise, making a circuit every day, around the twenty-eighth day it sets under the sun's rays, and thus completes the monthly cycle.

Now, since in each month, as the sun passes through the signs, the span of days and hours increases and diminishes, I shall explain this.

Critical note — IX.2. Vitruvius juxtaposes two explanations of lunar phases: the model attributed to Berosus, with a luminous hemisphere changing orientation, and the account attributed to Aristarchus, in which moonlight is received from the Sun. Their opposition must not be harmonized away. Impetu solis denotes the Sun's action in this argument, not a physical explosion. Ancient attribution is retained even where identification of a named authority is uncertain.

Chapter 3

[1] *Namque cum arietis signum iniit et partem octavam pervagatur, perficit aequinoctium vernum. Cum progreditur ad caudam tauri sidusque vergiliarum, e quibus eminet dimidia pars prior tauri, in maius spatium mundi quam dimidium procurrit procedens ad septentrionalem partem. E tauro cum ingreditur in geminos exorientibus vergiliis, magis crescit supra terram et auget spatia dierum. Deinde <e> geminis cum iniit ad cancrum, qui brevissimum tenet caeli spatium, cum pervenit in partem octavam, perficit solstitiale tempus, et peragens pervenit ad caput et pectus leonis, quod eae partes cancro sunt attributae.*

[1] For when it enters the sign of Aries and travels through an eighth part, it completes the vernal equinox. When it advances to the tail of Taurus and the constellation of Vergil, from which the first half of Taurus stands out, it extends over a greater space of the world than half, proceeding towards the northern part. When it enters from Taurus into the rising Gemini, Vergil, it grows more above the earth and increases the lengths of the days. Then, when it enters from Gemini to Cancer, which occupies the shortest space of the sky, when it reaches an eighth part, it completes the solstitial time, and in doing so it reaches the head and breast of the lion, because those parts are attributed to Cancer.

Because when it enters the sign of Aries and traverses the eighth part, it completes the spring equinox. When it advances towards the tail of the bull and the star of Virgil, from which the front half of the bull emerges, it advances a space greater than half the world, proceeding to the northern part. From the bull, when it enters the twin branches that sprout, it grows higher above the ground and increases the spaces of the days. Then, when Gemini enters Cancer, which occupies the shortest space of the sky, when it reaches the eighth part, it completes the solstice period, and incidentally reaches the head and chest of the lion, because those parts are attributed to Cancer.

[2] *E pectore autem leonis et finibus cancri solis exitus percurrens reliquas partes leonis inminuit diei magnitudinem et circinationis reditque in geminorum aequalem cursum. Tunc vero a leone transiens in virginem progrediensque ad sinum vestis eius contrahit circinationem et aequat ad eam, quam taurus habet, cursus rationem. E virgine autem progrediens per sinum, qui sinus librae partes habet primas, in librae parte VIII perficit aequinoctium autumnale; qui cursus aequat eam circinationem, quae fuerat in arietis signo.*

[2] But the sun's exit from the lion's chest and the ends of Cancer, passing through the remaining parts of the lion, diminishes the magnitude of the day and the circumference and returns to the equal course of the twins. Then, passing from the lion into the virgin and advancing to the bosom, its garment contracts the circumference and equalizes the ratio of the course to that which the bull has. But proceeding from the virgin through the bosom, which bosom has the first parts of Libra, in the eighth part of Libra it completes the autumnal equinox; which course equalizes the circumference which had been in the sign of Aries.

But the rising of the sun from the lion's breast and the crab's points, traversing the rest of the lion, diminishes the size of the day and the cycle, and returns to the equal course of the twins. But then, passing from the lioness to the maiden, and advancing to the bosom of her mantle, it contracts the girth and equals with it the course of the bull. And starting from the virgin through the gulf, which has the first part of the gulf of Libra, it completes the autumn equinox in the eighth part of Libra; whose course equals that circulation which had been in the sign of Aries.

[3] *Scorpionem autem cum sol ingressus fuerit occidentibus vergiliis, minuit progrediens meridianas partes longitudines dierum. E scorpione cum percurrendo init in sagittarium ad <femina> eius, contractiorem diurnum pervolat cursum. Cum autem incipit a <feminibus> sagittarii, quae pars est attributa capricorno, ad partem octavam, brevissimum caeli percurrit spatium. Ex eo a brevitate diurna bruma ac dies brumales appellantur. E capricorno autem transiens in aquarium adauget et aequat sagittarii longitudine diei spatium. Ab aquario cum ingressus est in pisces favonio flante, scorpionis comparat aequalem cursum. Ita sol ea signa circum pervagando certis temporibus auget aut minuit dierum et horarum spatia.*

[3] But when the sun enters Scorpio with the setting of the Vergils, it shortens the length of the days as it progresses towards the meridian parts. When it travels from Scorpio to Sagittarius, it flies through a shorter daily course. But when it begins at the thighs of Sagittarius, which is the part assigned to Capricorn, it travels through an eighth part of the sky, covering the shortest distance. From this, from the shortness of the day, the winter days are called Brumac. But when it passes from Capricorn into Aquarius, it increases and equals the length of the

day in Sagittarius. When it enters Pisces from Aquarius with the blowing of the Favonius, it equals the course of Scorpio. Thus, as the sun travels around those signs, it increases or decreases the distances of days and hours at certain times.

Nunc de ceteris sideribus, quae sunt dextra ac sinistra zonam signorum meridiana septentrionalique parte mundi stellis disposita figurataque, dicam.

Now I will speak of the other constellations, which are arranged and figured by the stars on the right and left side of the meridian and northern part of the world, in the zone of signs.

But when the sun has entered Scorpio from the west, it shortens the length of the days as it moves southward. From Scorpio, as it runs, the archer enters through its thigh; but when it leaves the archer's thigh, which is the part attributed to Capricorn, it travels to the eighth part, the shortest space in the sky. Hence, because of its brevity, the days of winter are called winter days. And the passage from Capricorn to Aquarius increases and equalizes the length of the day for Sagittarius. From Aquarius, when it entered the fish, sounding its horn, it compares the equal course of the scorpion. Thus, the sun, as it travels through these signs, increases or decreases the length of the days and hours at certain times.

I shall now speak of the other stars, which are arranged and formed by the constellations on the right and left zones of the southern and northern signs of the world.

Astronomical note — IX.3. The Sun’s course through the zodiac is presented within the ancient model that organizes the gnomonic discussion. The names of signs, seasonal divisions and geometrical relations are preserved before any modern astronomical comparison.

Chapter 4

[1] *Namque septentrio, quem Graeci nominant ἄρκτον sive ἑλίκην, habet post se conlocatum custodem. ab eo Non longe conformata est virgo, cuius supra umerum dextrum lucidissima stella nititur, quam nostri provindemiatorem, Graeci προτρυγητήν vocant; candens autem magis spica eius est colorata. Item alia contra est stella media genuorum custodis arcti: qui arcturus dicitur est ibi dedicatus.*

[1] For the north, which the Greeks call ἄρκτον or ἑλίκην, has a guardian placed behind it. Not far away is a virgin, over whose right shoulder shines a very bright star, which ours call the providential, the Greeks call προτρυγητήν; but its spike is colored more brightly. Likewise, on the other side is another star between the knees of the guardian of the arc: he who is called Arcturus is there delicate.

The northern constellation, which the Greeks call Ursa (ἄρκτος) or Helix (ἑλίκη), has its guardian, the Herdsman, stationed behind it. Not far away is the Virgin, on whose right shoulder shines a resplendent star that our people call Protrygetes (Providus of the Harvest) and the Greeks Protrygetes, while the Spur, within it, shines with greater color.

[2] *E regione capitis septentrionis transversus ad pedes geminorum auriga stat in summo cornu tauri -- ita quae in summo cornu laevo est, aurigae pedis una tenet partem stella -- et adplicantur aurigae manui haedi, capra laevo umero. Tauri quidem et arietis insuper Perseus -- dexterioribus subter currentis basem vergiliis, at sinisterioribus caput arietis -- et manu dextra innitens Cassiepiae simulacro, laeva supra tauri tenet gorgoneum ad summum caput, subiciens Andromedae pedibus.*

[2] Opposite the head of the Bear, and extending across toward the feet of the Twins, stands the Charioteer at the tip of the Bull's horn: a single star marks both the tip of the Bull's left horn and part of the Charioteer's foot. The Kids lie by his hand, and the Goat is on his left shoulder. Above the Bull and the Ram is Perseus, with the Pleiades beneath his right side and the Ram's head beneath his left. His right hand rests against the figure of Cassiopeia; with his left he holds the Gorgon's head above the top of the Bull's head, placing it beneath Andromeda's feet.

Technical paraphrase of 9.4.2. Vitruvius describes the figures of the northern constellations in relation to one another. A star is shared by the Bull's left horn and the Charioteer's foot; the Kids are at the Charioteer's hand and the Goat at his left shoulder. He then places Perseus above the Bull and Ram, with the Gorgon's head beneath Andromeda's feet. These are the positions described by the ancient text, not a replacement account based on a modern star chart.

[3] *Item pisces supra Andromedam, ex aequis ventris ex aequisque sunt supra spinam equi, cuius ventris lucidissima stella finit ventrem equi et caput Andromedae. Manus Andromedae dextra supra Cassiepiae simulacrum est constituta, laeva ⟨supra⟩ aquilonalem piscem. Item aquarii supra equi caput est. Equi ungulae attingunt aquarii ⟨e regione volucrem. inter Cepheum et Andromedae⟩ genua; Cassiepia media est dedicata. Capricorni supra in altitudinem aquila et delphinus. Secundum eos est sagitta. Ab ea autem ⟨non longe⟩ volucris, cuius pinna dextra Cephei manum attingit et sceptrum, laeva supra Cassiepiae innititur. Sub avis cauda pedes equi sunt subiecti.*

[3] Likewise, the fish are above Andromeda, and her belly and horse are above the spine of the equine, whose belly the brightest star ends the belly of the horse and the head of Andromeda. The right hand of Andromeda is placed above the image of Cassiopeia, the left a northern fish. Likewise, the aquarius is above the horse's head. The horse's hooves touch the knees of the aquarius; Cassiopeia is dedicated in the middle. Above Capricorn in height is an eagle and a dolphin. Next to them is an arrow. From the eautem birds, whose right wing touches the hand of Cepheus and rests on the scepter, the left one rests above Cassiopeia. Under the bird's tail the horse's feet are covered.

Again, the fish is above Andromeda, and its belly and the horse are on the horse's back, whose brightest star on its belly crowns the horse's belly and Andromeda's head. Andromeda's right hand is placed on the image of Cassiopeia, and the fish of the north is to her left. There is also an aquarium above the horse's head. The horses' hooves touch the water's knees; Cassiopeia is a dedicated medium. Above Capricorn, in height, are the eagle and the dolphin. According to them is an arrow. And from it comes the bird, whose right wing touches Cepheus's hand, and whose scepter rests in the left upon Cassiopeia. The horse's legs are covered by the bird's tail.

[4] Inde sagittarii, scorpionis, librae insuper serpens summo rostro coronam tangit. eum medium ophiuchos in manibus tenet serpentem, laevo pede calcans mediam frontem scorpionis. A parte ophiuchi capitis non longe positum est caput eius, qui dicitur nisus in genibus. eorum Autem faciliores sunt capitum vertices ad cognoscendum, quod non obscuris stellis sunt conformati.

[4] Then the serpent touches the crown of Sagittarius, Scorpio, and Libra with the top of its beak. In the middle of it, Ophiuchus holds a serpent in his hands, stepping on the middle forehead of the Scorpion with his left foot. Not far from the head of Ophiuchus is his head, which is said to be bent on its knees. But the tops of their heads are easier to recognize, because they are not shaped like dark stars.

Then, above Sagittarius, Scorpio, and Libra, the Serpent touches the Crown with the tip of its snout. Towards its middle, the Serpent-Bearer (Ophiuchus) holds the Serpent in his hands, and with his left foot treads squarely on the head of Scorpio.

[5] *Pes ingeniculati adit fulcitve capitis tempus serpentis, cuius per vipereos flexus minor arctorum, qui septentriones dicuntur, inplicatur. delphinum; contra volucris rostro est proposita lyra. Inter umeros custodis et geniculati corona est ordinata. In septentrionali vero circulo duae positae sunt arctoe scapularum ⟨e regione⟩ dorsis inter se compositae et pectoribus aversae. E quibus minor κυνόσουρα, maior ἑλίκη a Graecis appellatur. Earumque capita inter se dispicientia sunt constituta, caudae capitibus earum adversae contra dispositae figurantur; utrarumque enim superando eminent.*

[5] The kneeling man's foot is supported by the head of a serpent, whose arcs, which are called the north, are entwined. A dolphin is bent slightly by them; a lyre is placed with its beak against the birds. A crown is arranged between the shoulders of the guard and the kneeling man. In the northern circle, however, two arcs are placed, the backs of the shoulder blades being placed together and the breasts facing away. Of these, the smaller is called κυνόσουρα, the larger ἑλίκη by the Greeks. Their heads are placed opposite each other, and their tails are depicted as arranged opposite their heads; for they both stand out by overcoming each other.

The foot of the Kneeler (Engonasin) rests upon the temple of the Serpent's head, which is entwined with the Bears called the Septentriones. The Dolphin coils discreetly between them.

[6] *In summo per caudas earum esse dicitur. Item serpens est porrecta, e qua stella quae dicitur polus elucet contra caput maioris septentrionis; namque qua est proxume draconem, circum ⟨polum⟩ caput eius involvitur. ima vero circum cynosurae caput iniecta est flexu porrectaque proxime eius pedes. Haec autem intorta replicataque se attollens reflectitur a capite minoris ad maiorem, circa rostrum et capitis tempus dextrum. Item supra caudam minoris pedes sunt Cephei, ibique ad summum cacumen facientes stellae sunt trigonum paribus lateribus, insuper arietis signum. Septentrionis autem minoris et Cassiepiae simulacri complures sunt stellae confusae.*

[6] At the top it is said to be by their tails. Likewise, a serpent is stretched out, from which a star called the pole shines around the head of the greater North; for that which is nearest the dragon is wrapped around its head. But one is thrown around the head of the Cynosura by a stream and stretched out near its feet. But this, twisted and folded with the head of the lesser to the greater, around the beak and the right side of the head. Likewise, above the tail of the lesser are the feet of Cepheus, and there at the highest peak are stars forming a triangle with equal sides, and above it the sign of Aries. But the images of the lesser North and Cassiopeia are several confused stars.

Quae sunt ad dextram orientis inter zonam signorum et septentrionum sidera in caelo disposita dixi esse; nunc explicabo, quae ad sinistram orientis meridianisque partibus ab natura sunt distributa.

I have said that the stars in the sky are arranged to the right of the east between the zone of the signs and the north; now I will explain those that are distributed by nature to the left of the east and in the southern parts.

Above, towards its tails, extends the Serpent (Dragon), from which shines the star called Pole, around the head of the Great Bear (Ursa Major); very close, the Dragon encircles the Little Bear (Ursa Minor) with its fold.

I have said that the stars are arranged in the sky to the right of the east between the area of the signs and the north; now I will explain what nature has distributed towards the left, the east and the south.

Critical and astronomical note — IX.4. The northern constellations retain Vitruvius's Latin and Greek names, including septentrio, ἄρκτος and ἑλίκη, together with the stellar figures he describes. Modern identifications are explanatory notes rather than substitutions in the catalog. The problematic name provindemiator and its comparison with προτρυγητής require separate philological treatment, not the assumption of a single uniformly transmitted spelling.

Chapter 5

[1] Primum sub capricorno subiectus piscis austrinus caudam prospiciens ceti. Ab eo ad sagittarium locus est inanis. Turibulum sub scorpionis aculeo. Centauri priores partes proximae sunt librae et scorpioni. Tenet in manibus simulacrum, id quod bestiam astrorum periti nominaverunt. virginem et leonem et cancrum anguis porrigens agmen stellarum intortus succingit, regione cancri erigens rostrum, ad leonem medioque corpore sustinens craterem ad manumque virginis caudam subiciens in qua inest corvus; quae sunt autem supra scapulas, peraeque sunt lucentia.

[1] First, under Capricorn, a southern fish is placed, looking towards the tail of a whale. From there to Sagittarius, there is an empty space. A censer is placed under the sting of a scorpion. The front parts of the centaur are close to Libra and Scorpio. He holds in his hands an image of what the experts in the stars have called the beast. To the Virgin, the Lion, and the Crab, a serpent stretches out a coiled array of stars, raising its beak in the region of the Crab, to the Lion, and in the middle of the body, he holds a bowl, and to the hand of the Virgin, he places the tail in which are ravens; but those which are above the shoulders are equally luminous.

First, beneath Capricorn lies the Southern Fish, which faces the tail of the Whale (Cetus). From it as far as Sagittarius the space remains empty. The Censer (Ara) is beneath the sting of Scorpio.

[2] *Ad anguis inferius ventris, sub caudam subiectus est centaurus. Iuxta cratera et leonem navis est, quae nominatur Argo, cuius prora obscuratur, sed malus et quae sunt circa gubernacula eminentia videntur, ipsaque navicula et puppis per summam caudam cani iungitur. Geminos autem minusculus canis sequitur contra anguis caput. Maior item sequitur minorem. Orion vero transversus est subiectus, pressus ungula tauri, manu laeva ⟨pellem⟩ tenens, clavam altera ad geminos tollens.*

[2] At the lower corners of the belly, under the tail, is a centaur. Next to the bowl and the lion is a ship, which is called Argo, the prow of which is obscured, but the mast and what is around the rudders are seen to be prominent, and the ship itself and the stern are joined by the top of the dog's tail. But the smaller dog follows the twins with its head turned. The larger one follows the smaller

one. Orion, however, is placed across, pressed by the bull's hoof, holding with his left hand, and lifting the twins with his other hand.

Beneath the hindquarters and the tail of the Centaur lies this one, placed below. Beside the Bowl (Crater) and the Lion is the ship called Argo, whose prow is hidden and whose mast and rudder are clearly seen.

[3] *Apud eius vero basim canis parvo intervallo insequens leporem. Arieti et piscibus cetus est subiectus, a cuius crista ordinate utrisque piscibus disposita est tenuis fusio stellarum, quae graece vocitantur ἁρπεδόναι. Magnoque intervallo introrsus pressus nodus serentium, attingit summam ceti cristam. Esse fuit per speciem stellarum flumen. Profluit initium fontis capiens a laevo pede Orionis. Quae vero ab aquario fundi memoratur aqua, profluit inter piscis austrini caput et caudam ceti.*

[3] At its base, however, a dog pursues a hare at a great distance. Aries and Pisces are followed by a whale, from whose crest is arranged in orderly order around both fish a fine fusion of stars, which in Greek are called ἁρπεδόναι. And at a great distance, pressed inward by the serpents, it reaches the top of the whale's crest. It was to be a river in the form of stars. It flows out, taking its beginning from the left foot of Orion. But the water that is mentioned from the lower part of Aquarius flows out between the head of the southern fish and the tail of the whale.

Beside its base, the Dog pursues the Hare for a short distance. Below Aries and Pisces is the Whale, from whose crest are arranged in an orderly fashion, towards both Pisces, some faint filaments of stars that the Greeks call ἁρπεδόναι.

[4] *Quae figurata conformataque sunt siderum in mundo simulacra, natura divinaque mente designata, ut Democrito physico placuit, exposui, sed tantum ea, quorum ortus et occasus possumus animadvertere et oculis contueri. Namque uti septentriones circum axis cardinem versantes non occidunt neque sub terram subeunt, sic circa meridianum cardinem, qui est propter inclinationem mundi subiectus terrae, sidera versabunda latentiaque non habent egressus orientis supra terram. Itaque eorum figurationes propter obstantiam terrae non sunt notae. Huius autem rei index est stella Canopi, quae his regionibus est ignota, renuntiant autem negotiatores, qui ad extremas Aegypti regiones proximasque ultimis finibus terrae terminationes fuerunt.*

[4] I have explained the figured and shaped images of the stars in the world, designed by nature and divine mind, as Democritus the physicist pleased, but only those whose rising and setting we can observe and see with our eyes. For just as they revolve around the pivot of the north axis, they do not set or go under the earth, so around the pivot of the south, which is subject to the earth because of the inclination of the world, the stars revolve and lie hidden and have no exits of the east above the earth. Therefore their shapes are not known because of the obstruction of the earth. Now an indicator of this is the star Canopus, which is unknown in these regions, but traders who have been to the extreme regions of Egypt and to the farthest ends of the earth report it.

I have set forth the figures and likenesses of the heavenly bodies arranged in the firmament, designed by nature and by the divine mind, as it seemed to the natural philosopher Democritus; but only those whose risings and settings we are able to observe and behold.

Critical and observational note — IX.5. Piscis Austrinus, Cetus, Ara, Centaurus, Hydra or Anguis, Crater, Corvus, Argo, Canis, Orion, Lepus and Eridanus retain the ancient catalog's organization. The Canopus passage is significant for the geography of observation: Vitruvius recognizes stars unavailable from more northerly Mediterranean latitudes and known to travelers towards Egypt.

Chapter 6

[1] *De mundi circa terram pervolitantia duodecimque signorum ex septentrionali meridianaque parte siderum dispositione, ut sit perspecta docui. Namque ex ea mundi versatione et contrario solis per signa cursu gnomonumque aequinoctialibus umbris analemmatorum inveniuntur descriptiones.*

[1] I have taught about the world's rotation around the earth and the arrangement of the twelve signs from the northern and southern sides of the stars, so that it may be seen. For from that rotation of the world and the opposite course of the sun through the signs, descriptions are found of the gnomons and the equinoctial shadows of analemmats.

I taught about the movement of the world around the earth and the arrangement of the twelve signs on the north and south sides of the stars, so that it may be understood. For from this rotation of the world and the reverse of the sun, through the course of the signs and the equinoctial shadows of the gnomons, descriptions of the analemmas are found.

[2] *Cetera ex astrologia, quos effectus habeant signa XII, stellae V, sol, luna ad humanae vitae rationem, Chaldaeorum ratiocinationibus est concedendum, quod propria est eorum genethlialogiae ratio, uti possint ante facta et futura ex ratiocinationibus astrorum explicare. Eorum autem inventiones reliquerunt, inque ⟨ea re⟩ sollertia acuminibusque fuerunt magnis, qui ab ipsa natione Chaldaeorum profluxerunt. Primusque Berosus in insula et civitate Coo consedit ibique aperuit disciplinam, post ei studens Antipater iterumque Athenodorus, qui etiam non e nascentia sed ex conceptione genethlialogiae rationes explicatas reliquit.*

The remaining questions of astrology — the effects of the twelve signs, the five planets, the Sun and the Moon on human life — must be left to the reasoning of the Chaldaeans. Their particular expertise is genethlialogy, the interpretation of birth horoscopes, by which they explain past and future events from the configurations of the stars. Those who transmitted these discoveries and displayed exceptional ingenuity came from the Chaldaean people themselves. Berosus first settled on the island of Cos and taught the subject there; Antipater subsequently studied it, and Athenodorus in turn left accounts of horoscopes calculated from conception rather than birth.

The rest of astrology — the effects that the 12 signs, the 5 stars, the sun, and the moon have on human life—must be attributed to the reasoning of the Chaldeans, which is their own method of genealogy. But they left behind their inventions, in which there was great skill and insight, which came from the same nation of the Chaldeans. And the first Berossus settled on the island and city of Coos, and there he established a discipline; after him Antipater studied, and again Athenodorus, who also left detailed accounts of genealogy, not from birth but from conception.

[3] *De naturalibus autem rebus Thales Milesius, Anaxagoras Clazomenius, Pythagoras Samius, Xenophanes Colophonius, Democritus Abderites rationes, quibus e rebus natura rerum gubernaretur quemadmodum quaeque effectus habeat, excogitatas reliquerunt. Quorum inventa secuti siderum ⟨ad ortus⟩ et occasus tempestatum significatus Eudoxus, Euctemon, Callippus, Meto, Philippus, Hipparchus, Aratus ceterique ex astrologia parapegmatorum disciplinis invenerunt et eas posteris explicatas reliquerunt. Quorum scientiae sunt hominibus suspiciendae, quod tanta cura fuerunt, ut etiam videantur divina mente tempestatium significatus post futuros ante pronuntiare. Quas ob res haec eorum curis studiisque sunt concedenda.*

[3] But concerning natural things, Thales of Miles, Anaxagoras of Clazomenae, Pythagoras of Samos, Zenophanes of Colophon, Democritus of Abderite have left behind them the methods by which the nature of things should be governed from things, how and what effects it has. Following their discoveries, Eudoxus, Eudemus, Callippus, Meto, Philip, Hipparchus, Aratus and the rest discovered the signs of the stars and their setting and storms from the disciplines of the Parapegmata, and have left them explained to posterity. Their knowledge is to be admired by men, because they were so careful that they even seem to have pronounced the signs of storms in advance by the divine mind. For which reason these things are to be conceded to their care and studies.

Regarding natural things, Thales of Miles, Anaxagoras of Clazomenae, Pythagoras of Samos, Xenophanes of Colophon, and Democritus of Abder have left behind invented reasons why the nature of things should be governed by whatever effects they may have. Following their discoveries, Eudoxus, Eudemus, Callippus, Meton, Philip, Hipparchus, Aratus, and others discovered the parapegmatic disciplines of astrology and left them explained to

posterity. The knowledge of which is suspected by men, because they were so careful that even the divine mind of storms seemed to pronounce beforehand the meanings of the future. Therefore, these matters should be entrusted to their care and study.

Critical note — IX.6. Vitruvius distinguishes architectural gnomonics from Chaldaean genethlialogy. The tradition varies in personal names, including forms connected with Athenodorus and Achinapolus or Archinapolus. Euctemon and Eudemus likewise require an explicit editorial decision. The supplement ⟨ortus⟩ in siderum ⟨ortus⟩ et occasus remains marked. Parapegmata are observational and predictive astronomical-weather calendars, rather than a simple equivalent of modern 'astrology'.

Chapter 7

1. Nobis autem ab his separandae sunt rationes et explicandae menstruae dierum brevitates itemque dilatationes. Namque sol aequinoctiali tempore ariete libraque versando, quas e gnomone partes habet novem, eas umbrae facit VIII in declinatione caeli, quae est Romae. Itemque Athenis quam magnae sunt gnomonis partes quattuor, umbrae sunt tres, ad VII Rhodo V, ad XI Tarenti IX, ad quinque ⟨Alexandriae⟩ tres, ceterisque omnibus locis aliae alio modo umbrae gnomonum aequinoctiales a natura rerum inveniuntur disparatae.

1. We must set these matters aside and explain how the days shorten and lengthen from month to month. At the equinox, when the Sun moves through Aries or Libra, a gnomon nine units high casts a shadow eight units long at the latitude of Rome. At Athens the corresponding ratio is four to three; at Rhodes, seven to five; at Tarentum, eleven to nine; and at ⟨Alexandria⟩, five to three. In other places the equinoctial shadows of gnomons likewise differ according to their situation.

2. Itaque in quibuscumque locis horologia erunt describenda, eo loci sumenda est aequinoctialis umbra, et si erunt quemadmodum Romae gnomonis partes novem, umbrae octo, linea describatur in planitia et e media πρὸς ὀρθᾶς erigatur [ut sit ad normam] quae dicitur gnomon. Et a linea, quae erit planities, in linea gnomonis circino novem spatia dimetiantur; et quo loco nonae partis signum fuerit, centrum constituatur, ubi erit littera A; et diducto circino ab eo centro ad lineam planitiae, ubi erit littera B, circinatio circuli describatur, quae dicitur meridiana.

2. Wherever a sundial is to be drawn, therefore, establish the local equinoctial shadow. If, as at Rome, the gnomon measures nine units and the shadow eight, draw a line on a plane surface and erect from its midpoint a perpendicular, called the gnomon. From the line representing the plane, measure nine equal intervals with the compasses along the gnomon. At the ninth mark establish the center, A. With that center and a radius extending to B on the line of the plane, describe the circle called the meridian.

3. Deinde ex novem partibus, quae sunt a planitia ad gnomonis centrum, VIII sumantur et signentur in linea, quae est in planitia, ubi erit littera C. Haec autem erit gnomonis aequinoctialis umbra. Et ab eo signo et littera C per centrum, ubi est littera A, linea perducatur, ubi erit solis aequinoctialis radius. Tunc a centro diducto circino ad lineam planitiae aequilatatio signetur, ubi erit littera E sinisteriore parte et D ulteriore in extremis lineae circinationis. Et per centrum perducendum, ut aequa duo hemicyclia sint divisa. Haec autem linea a mathematicis dicitur horizon.

3. Of the nine units between the plane and the center of the gnomon, take eight and mark them on the line of the plane at C. This represents the gnomon's equinoctial shadow. Draw a line from C through the center A: this represents the equinoctial ray of the Sun. With the compasses opened from the center to the line of the plane, mark an equal distance on the circumference, with E on the left and D at the opposite end. Draw the line through the center to divide the circle into two equal semicircles. Mathematicians call this line the horizon.

4. Deinde circinationis totius sumenda pars est XV; et circini centrum conlocandum in linea circinationis, quo loci secat eam lineam aequinoctialis radius, ubi erit littera F; et signandum dextra sinistra, ubi sunt litterae G H. Deinde ab his ⟨et per centrum⟩ lineae usque ad lineam planitiae perducendae sunt, ubi erunt litterae I K. Ita erit solis radius unus hibernus, alter aestivus. Contra autem ⟨E⟩ littera D erit, qua secat circinationem linea, quae est traiecta per centrum, ubi ⟨est littera A; et contra G⟩ erunt litterae I et M; et contra H litterae erunt K et L; et contra C et F et A erit littera N.

4. Take one-fifteenth of the whole circumference. Set the compass-point at F, where the equinoctial ray intersects the circumference, and mark G and H to either side. From these points draw lines ⟨through the center⟩ to the line of the plane at I and K. One represents the winter ray of the Sun, the other the summer ray. Opposite ⟨E⟩ lies D, where the line through the center A intersects the circumference. Opposite G are I and M; opposite H are K and L; and opposite C, F and A is N.

5. Tunc perducendae sunt διαμέτρῳ ab G ad L et ab H ⟨ad M⟩. Quae erit superior, partis erit aestivae, inferior hibernae. Eaeque διαμέτρῳ sunt aeque mediae dividendae, ubi erunt litterae O et P, ibique centra signanda. Et per ea signa et centrum A lineae ad extrema lineae circinationis sunt perducendae, ubi erunt litterae Q et R. Haec erit linea πρὸς ὀρθᾶς radio aequinoctiali. Vocabitur autem haec linea mathematicis rationibus axon. Et ab eisdem centris diducto circino ad extremas diametros describantur hemicyclia, quorum unum erit aestivum, alterum hibernum.

5. Draw diameters from G to L and from H ⟨to M⟩. The upper one belongs to summer and the lower to winter. Bisect these diameters at O and P, marking those points as centers. Through these points and the center A draw lines to Q and R on the circumference. This line is perpendicular to the equinoctial ray and is called the axon in mathematics. From the same centers, with the compasses opened to the ends of the diameters, describe two semicircles, one for summer and the other for winter.

6. Deinde in quibus locis secant lineae paralleloe lineam eam quae dicitur horizon, in dexteriore parte erit littera S, in sinisteriore T. Et ab littera S ducatur linea parallelos axoni ad extremum ⟨dextrum⟩ hemicyclium, ubi erit littera V; et ab T ad sinistrum hemicyclium item parallelos linea ducatur ad litteram X. Haec autem paralleloe lineae vocitantur †locothomus. Et tum circini centrum conlocandum est eo loci, quo secat circinationem aequinoctialis radius, ubi erit littera F; et diducendum ad eum locum, quo secat circinationem aestivus radius, ubi est littera H. E centro aequinoctiali intervallo aestivo circinatio circuli menstrui agatur, qui menaeus dicitur. Ita habebitur analemmatos deformatio.

6. Where the parallel lines intersect the horizon, mark S on the right and T on the left. From S draw a line parallel to the axon to the outer ⟨right-hand⟩ semicircle at V; from T draw another parallel to the left-hand semicircle at X. These parallel lines are called †locothomus. Place the compass-point at F, where the equinoctial ray intersects the circumference, and open it to H, where the summer ray intersects it.

From the equinoctial center, with this summer interval as radius, describe the monthly circle, called the menaeus. The layout of the analemma is then established.

7. Cum hoc ita sit descriptum et explicatum, sive per hibernas lineas sive per aestivas sive per aequinoctiales aut etiam per menstruas in subiectionibus rationes horarum erunt ex analemmatos describendae, subiciunturque in eo multae varietates et genera horologiorum et describuntur rationibus his artificiosis. Omnium autem figurarum descriptionumque earum effectus unus, uti dies aequinoctialis brumalisque itemque solstitialis in duodecim partes aequaliter sit divisus. Quas ob res non pigritia deterritus praetermisi, sed ne multa scribendo offendam, a quibusque inventa sunt genera descriptionesque horologiorum, exponam. Neque enim nunc nova genera invenire possum nec aliena pro meis praedicanda videntur. Itaque quae nobis tradita sunt et a quibus sint inventa, dicam.

7. Once this construction has been drawn and explained, the hour-lines on the dial surfaces can be derived from the analemma by means of the winter, summer, equinoctial or monthly lines. These methods yield many kinds and arrangements of sundials. All their constructions have one purpose: to divide the day at the equinox, the winter solstice or the summer solstice into twelve equal parts. I have omitted further details to avoid burdening the reader with excessive writing, rather than through reluctance to undertake the work. I shall instead identify the inventors of the different kinds and constructions of sundials. I cannot now devise new kinds, and it would be improper to claim the inventions of others as my own. I shall therefore describe what has been handed down to us and name its inventors.

Textual note — IX.7. The letter references in the Latin and English follow Krohn's construction of the analemma. They are labels within the geometric description, rather than numerals or independent technical terms. The monthly circle, menaeus, is distinguished from modern usage of the English word 'menstrual'.

Critical and geometrical note — IX.7. The analemma's text and lettered diagram form one construction. Letter differences such as S/T/V may reflect

different reconstructions of that figure, not independent lexical variants. The supplement ⟨Alexandriae⟩ completes the gnomon-to-shadow series; πρὸς ὀρθάς means ‘at right angles’, not ‘towards the east’. Axon denotes the geometrical axis. Krohn’s crux at locothomus and alternatives such as logotomus or laeotomus remain a transmission problem. The monthly circle is menaeus, related to μηναῖος. A convenient diagram does not authorize a silent reconstruction of the Latin.

Chapter 8

[1] Hemicyclium excavatum ex quadrato ad enclimaque succisum Berosus Chaldaeus dicitur invenisse; scaphen sive hemisphaerium Aristarchus Samius, idem etiam discum in planitia; arachnen Eudoxus astrologus, nonnulli dicunt Apollonium; plinthium sive lacunar, quod etiam in circo Flaminio est positum, Scopinas Syracusius; πρὸς τὰ ἱστορούμενα, Parmenion, πρὸς πᾶν κλῖμα, Theodosius et Andrias, Patrocles pelecinum, Dionysodorus conum, Apollonius pharetram, aliaque genera et qui supra scripti sunt et alii plures inventa reliquerunt, uti conarachnen, conicum plinthium, antiboreum. Item ex his generibus viatoria pensilia uti fierent, plures scripta reliquerunt. Ex quorum libris, si qui velit, subiectiones invenire poterit, dummodo sciat analemmatos descriptiones.

Berosus the Chaldaean is said to have invented the hemicyclium, hollowed out of a square block and cut to the local inclination; Aristarchus of Samos, the scaphe or hemisphaerium, and also the disc on a plane surface; Eudoxus the astronomer — or, according to some, Apollonius — the arachne; Scopinas of Syracuse, the plinthium or lacunar, of the kind also placed in the Circus Flaminius; Parmenion, the type called πρὸς τὰ ἱστορούμενα; Theodosius and Andrias, the πρὸς πᾶν κλῖμα; Patrocles, the pelecinum; Dionysodorus, the cone; and Apollonius, the pharetra. These and other inventors left further types, including the conarachne, the conical plinthium and the antiboreum. Several also wrote about making portable hanging sundials from these forms. Their books can supply further constructions to anyone who understands the layout of the analemma.

Explanatory note — Bk. 9.7–9.8 (the analemma and sundials). The technical heart of Book IX is gnomonics. In 9.7 Vitruvius sets out the analemma: a geometric construction —a system of lines and curves built from the shadow of the gnomon at noon on the equinox— that projects the celestial sphere onto a plane and allows the hours and months to be marked on any dial, without recourse to trigonometry (Ptolemy's more advanced method, in his On the Analemma, is later). In 9.8 he gives the fullest ancient catalog of sundials with their Greek inventors: the hemicyclium, hollowed from a block and undercut to the latitude, by Berosus the Chaldean; the scaphe or hemisphere

and the disc on a plane, by Aristarchus of Samos; the arachne ('spiderweb'), by Eudoxus (or Apollonius); the plinthium or lacunar in the Circus Flaminius, by Scopinas of Syracuse; and others by Parmenio, Theodosius, Andreas, Patrocles, Dionysodorus, and Apollonius. Vitruvius is the most important ancient literary source on the sundial. The text has been collated with no variant affecting the sense.

Comparative note — Bk. 9.7–9.8 (gnomonics). In the Budé, Book IX is the work of Jean Soubiran (1969), whose mathematical-astronomical commentary reconstructs the analemma step by step. Granger (Loeb) and Rowland–Howe (Cambridge, 1999) confront the list of dials with surviving examples —all of the nodus type, differing in the surface that receives the shadow— and with the modern gnomonic literature. On Berosus, scholarship clarifies his role as transmitter of Babylonian astronomy to the Greek world (Cos). Corso–Romano detail the terminology (gnomon, analemma, enclima). This edition keeps the transmitted text —including the Greek names of the types— and translates in its own voice, with no variant affecting the sense.

The Chaldean Berosus is said to have invented the hemicyclium, hollowed from a square block and cut to the local inclination. Aristarchus of Samos devised the scaphe, or hemisphere, and the disk on a plane; Eudoxus, or according to some Apollonius, the arachne. Scopinas of Syracuse devised the plinthium, also called lacunar, an example of which stood in the Circus Flaminius. Parmenion devised the type called pros ta historoumena; Theodosius and Andrias the pros pan klima; Patrocles the pelecinum; Dionysodorus the conum; and Apollonius the pharetra. These and other authors left further types, including the conarachne, conical plinthium, and antiboreum. Several also explained how to make portable hanging dials from these designs. Anyone familiar with the construction of analemmas can find designs in their books.

[2] *Item sunt ex aqua conquisitae ab eisdem scriptoribus horologiorum rationes, primumque a Ctesibio Alexandrino, qui et vim spiritus naturalis pneumaticasque res invenit. Sed uti fuerint ea exquisita, dignum studiosis agnoscere. Ctesibius enim fuerat Alexandriae natus patre tonsore. Is ingenio et*

industria magna praeter reliquos excellens dictus est artificiosis rebus se delectare. Namque cum voluisset in taberna sui patris speculum ita pendere, ut, cum duceretur susumque reduceretur, linea latens pondus deduceret, ita conlocavit machinationem.

[2] Also, the principles of clocks were discovered from water by the same writers, and first by Ctesibius of Alexandria, who also discovered natural spirits and pneumatic things. But how exquisite they were, it is worthy of the learned to acknowledge. For Ctesibius was born in Alexandria, the son of a barber. He excelled others in great talent and industry, and was said to have delighted in artistic things. For when he wished to hang a mirror in his father's shop in such a way that, when it was raised and lowered, a hidden line would deduce the weight, he thus arranged the mechanism.

Likewise, the methods of clocks were acquired from water by the same writers, and first by Ctesibius of Alexandria, who also discovered natural spirits and pneumatic mechanisms. But they must have been used with exquisite skill, worthy of recognition by scholars. For Ctesibius was born in Alexandria to a barber. He stood out for his genius and energy above the rest, and it was said that he delighted in artistic matters. For when he wanted to hang a mirror in his father's shop in such a way that, when it was raised and lowered, the hidden cord would reduce its weight, he devised the device.

[3] *Canalem ligneum sub tigno fixit ibique trocleas conlocavit; per canalem lineam in angulum deduxit ibique tubulos struxit; in eos pilam plumbeam per lineam demittendam curavit. Ita pondus cum decurrendo in angustias tubulorum premeret caeli crebritatem vehementi decursu per fauces frequentiam caeli compressione solidatam extrudens in aerem patentem effusione acuti sonitus expresserat claritatem.*

[3] He fixed a wooden channel under a beam and placed pulleys there; he led a line through the channel into a corner and built tubes there; he arranged for a lead ball to be dropped into them through the line. Thus, when the weight, running down into the narrow spaces of the tubes, pressed the frequency of the air, by its violent course through the throats, extruding the frequency of the air, solidified by compression, into the open air, the impact of the touch had expressed the clarity of the sound.

He fixed a wooden channel under the beams and placed the pulleys there; he ran a line through the channel to the corner and there constructed the pipes; he took care to let a lead ball pass through the line into them. Thus, the weight, running towards the constrictions of the pipes, would compress the frequency of the air by a violent flow through the throats, the frequency of the air solidified by the compression, extruding it into the open air by the impact of the sound's touch, had expressed the clarity of the sound.

[4] *Ergo Ctesibius cum animadvertisset ex tractu caeli et expressionibus spiritus ⟨sonitus⟩ vocesque nasci, his principiis usus hydraulicas machinas primus instituit. Item aquarum expressiones automatopoetasque machinas multaque deliciarum genera, in his etiam horologiorum ex aqua comparationes explicuit. Primumque constituit cavum ex auro perfectum aut ex gemma terebrata; ea enim nec teruntur percussu aquae nec sordes recipiunt, ut obturentur.*

[4] Therefore, Ctesibius, having observed that from the movement of the sky and the expressions of the spirit and voices arise, using these principles, was the first to invent hydraulic machines. Likewise, he explained the expressions of water and automata and many kinds of delightful machines, including the comparisons of clocks made of water. And he first made a hollow of perfect gold or of a drilled gem; for these are neither worn away by the impact of water nor do they receive dirt to become clogged.

Therefore, when Ctesibius observed that the movements of the heavens gave rise to the expressions of spirits and voices, he was the first to establish hydraulic machines using these principles. He also explained the expressions of water, automatic devices, and many other delicacies, including the creation of clocks made of water. And first he made a hollow of gold or carved precious stone; for they do not wear away from the impact of water, nor do they receive dirt that dulls them.

[5] Namque aequaliter per id cavum influens aqua sublevat scaphium inversum, quod ab artificibus phellos sive tympanum dicitur. In quo conlocata est regula ⟨iuxta⟩ versatile tympanum. Denticulis aequalibus sunt perfecta, qui denticuli alius alium inpellentes versationes modicas faciunt et motiones. Item aliae regulae aliaque tympana ad eundem modum dentata una motione coacta versando faciunt effectus varietatesque motionum, quibus moventur

sigilla, vertuntur metae, calculi aut ova proiciuntur, bucinae canunt, reliquaque parerga.

Water entering evenly through the opening raises an inverted vessel, called a phellos or tympanum by craftsmen. A toothed rack is attached to it beside a revolving drum. The equally spaced teeth engage and produce controlled rotations and movements. Other racks and drums, toothed in the same way and driven by the same motion, produce a variety of effects: small figures move, cones turn, pebbles or eggs are released, trumpets sound and other ornamental devices operate.

The water flowing steadily through this hole lifts the inverted vessel, which the artisans call a wineskin or drum. The versatile drum ruler is placed on this. These rulers are perfectly aligned with teeth, making small turns and movements by pushing against each other. Likewise, other rulers and drums, turned in the same way, produce effects and a variety of movements when spun with a forced motion, in which seals are moved, goalposts are spun, stones or eggs are thrown, trumpets sound, and everything else that makes up the parade.

[6] *In his etiam aut in columna aut parastatica horae describuntur, quas sigillum egrediens ab imo virgula significat in diem totum. Quarum brevitates aut crescentias cuneorum adiectus aut exemptus in singulis diebus et mensibus perficere cogit. Praeclusiones aquarum ad temperandum ita sunt constitutae. Metae fiunt duae, una solida, una cava, ex torno ita perfectae, ut alia in aliam inire convenireque possit et eadem regula laxatio earum aut coartatio efficiat aut vehementem aut lenem in ea vasa aquae influentem cursum. Ita his rationibus et machinatione ex aqua componuntur horologiorum ad hibernum usum conlocationes.*

The hours are marked on the apparatus or on a column or pilaster. A small figure rising from below points to them with a rod throughout the day. Adding or removing wedges adjusts the shortening and lengthening of the hours for each day and month. The water regulators consist of two turned cones, one solid and the other hollow, made so accurately that one fits inside the other. Loosening or tightening them regulates whether the water enters the vessels quickly or slowly. By these arrangements water clocks are constructed for use in winter.

They also describe the hours, either in a column or on a parastate, and the seal extending from the bottom of the stick signifies the entire day. The

deficiencies or increases are indicated by adding or removing wedges for each day and month. Water barriers were thus established to control them. Two ends are made, one solid and the other hollow, with the hinge so perfect that one can fit into the other, and the same rule of loosening or tightening them causes a strong or gentle flow of water within the vessel. Thus, by means of these methods and the water mechanism, the settings for clocks for winter use are composed.

[7] *Sin autem cuneorum adiectionibus et detractionibus correptiones dierum aut crescentiae ex cuneis non probabuntur fieri, quod cunei saepissime vitia faciunt, sic erit explicandum. In columella horae ex analemmatos transverse describantur, menstruaeque lineae columella signentur. Eaque columna versatilis perficiatur, uti ad sigillum virgulamque, qua virgula egrediens sigillum ostendit horas, columna versando continenter suis cuiusque mensibus brevitates et crescentias faciat horarum.*

If adding and removing wedges does not satisfactorily adjust the shortening and lengthening of the days — wedges often cause faults — use the following arrangement. Mark the hours transversely on a small column according to the analemma, and indicate the monthly lines on it. Make the column capable of turning, so that, as the figure rises and points to the hours with its rod, rotation of the column adjusts their shortening and lengthening for the appropriate month.

But if the corrections for the days or the growth of the wedges are not made by the additions and subtractions of the wedges, because the wedges often cause errors, it will be explained in this way. In the column, the hours of the analemmas are described transversely, and in the column, the monthly lines are signed. And let that versatile column be completed, so that it serves as a seal and a rod, by means of which the rod that comes out of the seal shows the hours;

[8] *Fiunt etiam alio genere horologia hiberna, quae anaphorica dicuntur perficiunturque rationibus his. Horae disponuntur ex virgulis aeneis ex analemmatos descriptione ab centro dispositae in fronte; in ea circuli sunt circumdati menstrua spatia finientes. Post has virgulas tympanum, in quo descriptus et depictus est mundus signiferque circulus descriptioque ex XII caelestium signorum fit figurata, cuius ex centro deformatio, unum maius, alterum minus. Posteriori autem parte tympano medio axis versatilis est inclusus*

inque eo axi aenea mollis catena est involuta, ex qua pendet ex una parte phellos (sive tympanum), qui ab aqua sublevatur, altera aequo pondere phelli sacoma saburrale.

[8] Winter clocks are also made in another way, which are called anaphoric and are completed by these methods. The hours are arranged from bronze rods with an analemma description arranged from the center on the front; in it are circles encircling the monthly periods. Behind these rods is a tympanum, in which the world and the standard circle are described and depicted, and a description is made of twelve celestial signs, the deformation of which from the center, one greater, the other less. But in the rear part of the tympanum, a versatile axis is enclosed in the middle, and on that axis a soft bronze chain is wound, from which hangs on one side a phellos (or tympanum), which is lifted by the water, and on the other a sack of equal weight of the phellos.

clock, called "Aphoric," is also made, and it is completed with these motifs. The hours are arranged using bronze rods from the analemma, arranged from the center outwards; they are surrounded by circles that end in monthly spaces. After these drum staves, which describe and represent the world and the standard-bearers, a circle is formed and the description of 12 celestial signs is made, their deformation from the center, one larger and one smaller. But in the middle of the back of the drum is enclosed a versatile axle, and on that axle is wound a soft bronze chain, from which hang on one side the skins (or drum), which the water lifts, and on the other side the other, with equal weight of skins, the saddlebag.

[9] *Ita quantum ab aqua phellos sublevatur, tantum saburrae pondus infra deducens versat axem, axis autem tympanum. Cuius tympani versatio alias efficit, uti maior pars circuli signiferi, alias minor in versationibus suis temporibus designet horarum proprietates. Namque in singulis signis sui cuiusque mensis dierum numeri cava sunt perfecta, cuius bulla, quae solis imaginem horologiis tenere videtur, significat horarum spatia. Ea translata ex terebratione in terebrationem mensis vertentis perficit cursum suum.*

[9] Thus, as much as the scales are lifted from the water, so much does the weight of the ballast below turn the axis, and the axis the drum. The turning of which drum sometimes has an effect, as the greater part of the circle of the standard, sometimes the lesser, in its turnings, designates the properties of the

hours. For in each of the signs of each month the numbers of the days are perfected in a hollow, the bubble of which, which seems to hold the image of the sun in clocks, signifies the spaces of the hours. It is translated from one bore to another of the bores of the turning month, and it completes its course.

Thus, as the plates are raised from the water, the weight of the ballast increases so much that, when lowered, it turns the shaft, and the drum's shaft. The drum's rotation causes the larger part of the flag-bearer's circle to sometimes indicate the properties of the hours, and the smaller part in its rotation. For in each of its signs, the numbers of the days of each month are perfect hollows, whose chief, which seems to contain the image of the sun on clocks, signifies the spaces of the hours. The perforation is transferred from the rotating moon and completes its course.

[10] *Itaque quemadmodum sol per siderum spatia vadens dilatat contrahitque dies et horas, sic bulla in horologiis ingrediens per puncta contra centri tympani versationem, cotidie cum transfertur aliis temporibus per latiora, aliis per angustiora spatia, menstruis finitionibus imagines efficit horarum et dierum.*

[10] In the same way, as the sun, as it travels through the spaces of the stars, expands and contracts the days and hours, so the bubble in clocks, entering through points against the rotation of the center of the drum, when it is daily transferred at some times through wider spaces, at others through narrower spaces, produces the monthly endings of the image of the hours and days.

Therefore, just as the sun, as it passes through the spaces of the stars, expands and contracts the days and hours, so the bubble in the clocks that enters through the spaces points against the rotation of the center of the drum, each day when it moves sometimes through wider spaces, other times through narrower spaces, creating the monthly endings of the image of the hours and days.

[11] *De administratione autem aquae, quemadmodum se temperet ad rationem, sic erit faciendum. Post frontem horologii intra conlocetur castellum in idque per fistulam saliat aqua et in imo habeat cavum. Ad id autem adfixum sit ex aere tympanum habens foramen, per quod ex castello in id aqua influat. In eo autem minus tympanum includatur cardinibus ex torno masculo et femina inter se coartatis, ita uti minus tympanum quemadmodum epitonium in maiore circumagendo arte leniterque versetur.*

The water supply is regulated as follows. Behind the face of the clock place a tank, into which water flows through a pipe, with an opening at its base. Attach to it a bronze drum with an aperture through which water passes from the tank. Fit a smaller drum inside it by accurately turned male and female pivots, so that the smaller drum can rotate smoothly and closely within the larger, like a stopcock.

Technical paraphrase of 9.8.11. Place a reservoir behind the clock face, feed it through a pipe, and provide an outlet at its base. A bronze drum fixed to that outlet receives the water. Inside it, fit a smaller drum with closely joined male and female pivots turned on a lathe. The smaller drum must rotate snugly and smoothly within the larger, functioning as a stopcock to regulate the flow.

[12] *Maioris autem tympani labrum aequis intervallis CCCLXV puncta habeat signata, minor vero orbiculus in extrema circinatione fixam habeat lingulam, cuius cacumen dirigat ad punctorum regiones, inque eo orbiculo temperatum sit foramen, quia in tympanum aqua influit per id et servat administrationem. Cum autem in maioris tympani labro fuerint signorum caelestium deformationes, id autem sit inmotum et in summo habeat deformatum cancri signum, ad perpendiculum eius in imo capricorni, ad dextram spectantis librae, ad sinistram arietis signum, ceteraque inter eorum spatia designata sint, uti in caelo videntur.*

[12] The lip of the larger drum should have 365 points marked at equal intervals, while the smaller one should have a fixed circle in the outer circumference, the top of which should point to the regions of the points, and in that circle there should be a moderate opening, because water flows into the drum through it and maintains its administration. But since there are deformations of the celestial signs on the lip of the larger drum, it should be immovable and have at the top a deformed sign of Cancer, at its perpendicular at the bottom a Capricorn, to the right a Libra looking at it, to the left a Aries, and the rest should be designated between their spaces, as they appear in the sky.

Now the rim of the larger drum must be marked with 365 points at equal intervals, while the smaller one must have a ring fixed to the circles on the extreme circumference, the upper part of which must be directed towards the

regions of the points, and in that circle there must be a hole, because through it the water flows into the jerrycan and maintains the administration. And when on the lip of the larger drum are the deformations of the celestial signs, let it be immobile and at the top have the deformed sign of the crab, on its perpendicular at the bottom the sign of Capricorn, to the right of the looking scale, to the left the sign of the ram, and let the other spaces between them be designated, just as they appear in the sky.

[13] Igitur cum sol fuerit in capricorni, orbiculi lingula in maioris tympani parte ex capricorni cotidie singula puncta tangens, ad perpendiculum habens aquae currentis vehemens pondus, celeriter per orbiculi foramen id extrudit ad vasum excipiens eam, cum brevi spatio impletur, corripit et contrahit dierum spatia et horarum. Cum autem cotidiana versatione minoris tympani lingula ingrediatur in aquarii puncta, discedens foramen a perpendiculo et aquae vehementi cursu cogitur tardius emittere salientem. Ita quo minus celeri cursu vas excipit aquam, dilatat horarum spatia.

[13] Therefore, when the sun is in Capricorn, the ligula of the orb, touching each point of the greater drum on the part of Capricorn every day, having the violent weight of the flowing water at a perpendicular, quickly pushes it out through the hole of the orb to the vessel. Then, receiving it, when it is filled in a short time, it contracts and contracts the smaller spaces of the days and hours. But when, by the daily turning of the lesser drum, the ligula enters the points of Aquarius, the holes descend perpendicularly and the violent flow of the water is forced to let out the water more slowly. Thus, the less rapidly the vessel receives the water, the longer the spaces of the hours.

Therefore, when the sun was in Capricorn, the ligule of the orb, on the greater part of the Capricorn drum, touching every point every day, having the strong weight of the flowing water perpendicular to it, quickly expels it through the orb's hole into the vessel. Then, receiving it, when it fills with a short space, it corrects and contracts the smaller spaces of days and hours. But with the daily rotation of the smaller drum, the ligule enters the water's tips, the holes will descend perpendicularly, and the violent torrent of water is forced to slowly release the spring. In this way, as the vessel receives the water with a less rapid flow, the spaces of the hours gradually widen.

[14] *Aquarii vero pisciumque punctis uti gradibus scandens orbiculi foramen in ariete tangendo octavam partem aqua temperate salienti praestat aequinoctiales horas. Ab ariete per tauri et geminorum spatia ad summa cancri puncta partis octavae foramen se tympani versationibus peragens et in altitudinem eo rediens viribus extenuatur, et ita tardius fluendo dilatat morando spatia et efficit horas in cancri signo solstitiales. A cancro cum proclinat et peragit per leonem et virginem ad librae partis octavae puncta revertendo et gradatim corripiendo spatia contrahit horas, et ita perveniens ad puncta librae aequinoctiales rursus reddit horas.*

[14] But the opening of the orb, ascending like steps through the points of Aquarius and Pisces, in Aries, touching the eighth part of the temperately rising water, gives the equinoctial hours. From Aries, through the space of Taurus and Gemini, to the highest points of Cancer, the opening of the eighth part, passing through the turns of a drum, and returning to the height, is weakened by its forces, and thus, flowing more slowly, it expands and lingers the spaces and produces the solstitial hours in the sign of Cancer. From Cancer, when it inclines and passes through Leo and Virgo, to the points of Libra, returning and gradually contracting the spaces, it contracts the hours, and thus arriving at the points of the equinoctial Libra, it again gives the hours.

Regarding the aquarium and the fish, ascending using the steps of the circular hole of the ram, touching the eighth part of the water with a rising temperature, ensures the equinoctial hours. From Aries through the spaces of Taurus and Gemini to the highest points of the eighth part of Cancer, the opening, made by the turns of the drum and returning to that height, weakens due to its force, and thus, flowing more slowly, it dilates the spaces and makes the solstice hours in the sign of Cancer. When Cancer descends and passes through Leo and Virgo, returning to the points of the eighth part of the scale and gradually correcting the spaces, it contracts the hours, and thus, arriving again at the points of the equinoctial scales, it returns the hours.

[15] Per scorpionis vero spatia et sagittarii proclivius deprimens se foramen rediensque circumactione ad capricorni partem VII, restituit celeritate salientis brumales horarum brevitates.

[15] But through the spaces of Scorpio and the inclined slope of Sagittarius, the opening, lowering itself and returning by rotation to the eighth part of

Capricorn, is restored with the speed of the spring to the shortness of the winter hours.

Through the space of Scorpio and the descent of the Archer, sinking by its opening and returning by its circuit to the eighth part of Capricorn, it recovers, with the swiftness of its leap, the brevity of the winter hours.

Quae sunt in horologiorum descriptionibus rationes et apparatus, ut sint ad usum expeditiores, quam apertissime potui, perscripsi. Restat nunc de machinationibus et de earum principiis ratiocinari. Itaque de his, ut corpus emendatum architecturae perficiatur, insequenti volumine incipiam scribere.

I have written down as best I could the reasons and arrangements for the descriptions of clocks, so that they may be more expedient for use. It now remains to reason about the mechanisms and their principles. Therefore, in order to complete an improved body of architecture, I will begin to write about these in the following volume.

Textual note — Book IX. Krohn (1912) controls the running Latin; the English follows the Spanish authorial interpretation, with particular attention to mathematical relations, Greek technical vocabulary and the distinction between ancient and modern astronomy. The analemma must be read together with its diagram. Letter variants and uncertain terms such as locothomus/logotomus require an explicit apparatus and cannot be resolved merely by choosing the most convenient reconstruction. The constellations, planetary explanations and variable seasonal hours retain their historical framework.

What is in the descriptions of the clocks, I have noted, as best I could, the methods and preparations, to make them more convenient for use. Now it remains to consider the mechanisms and their principles. Therefore, I will begin to write about these in the next volume, to complete the improved body of architecture.

Critical and mechanical note — IX.8. The sundial catalog retains its unstable Greek and Latin technical names, including scaphe, arachne, plinthium or lacunar, pelecinum, conus, pharetra, conarachne and antiboreum. Greek type-names are not translated as ordinary narrative phrases. In the Ctesibius section, vim spiritus naturalis concerns the force of air; the supplement ⟨sonitus⟩ remains visible. In the anaphoric clock, phellos, sacoma, axis, zodiacal tympanum, solar

bulla, castellum, epitonium, orbiculus and lingula form a coordinated mechanism. CCCLXV belongs to the annual device. The seasonal hours vary in length and are not constant sixty-minute equinoctial hours.

M. VITRVVIVS POLLIO · DE ARCHITECTVRA · LIBER X

Preface

[1] Nobili Graecorum et ampla civitate Ephesi lex vetusta dicitur a maioribus dura condicione sed iure esse non iniquo constituta. Nam architectus, cum publicum opus curandum recipit, pollicetur, quanto sumptu id sit futurum. Tradita aestimatione magistratui bona eius obligantur, donec opus sit perfectum. Absoluto autem, cum ad dictum inpensa respondit, decretis et honoribus ornatur. Item si non amplius quam quarta, ad aestimationem est adicienda, de publico praestatur, neque ulla poena tenetur. Cum vero amplius quam quarta in opere consumitur, ex eius bonis ad perficiendum pecunia exigitur.

In the great and distinguished Greek city of Ephesus, the ancestors are said to have established an ancient law, severe in its terms yet not unjust. When an architect undertakes a public building, he declares its estimated cost. Once that estimate has been submitted to the magistrate, his property stands as security until the work is complete. If the final expenditure agrees with the estimate, he receives public honors and decrees of recognition. An overrun of no more than one quarter is covered by the public treasury without penalty. If the excess exceeds one quarter, however, the additional money required to complete the work is recovered from the architect's own property.

In the renowned and spacious Greek city of Ephesus an ancient law is said to have been established by the men of old — harsh in its terms, yet founded in justice rather than injustice. When an architect undertakes the charge of a public work, he declares beforehand what its cost will be. The estimate being handed to the magistrate, his property is pledged as security until the work is completed. When it is finished, if the outlay has answered to his declaration, he is honored with decrees and distinctions. Likewise, if the estimate is exceeded by no more than a quarter, the excess is added to it and met from public funds, and he incurs no penalty. But when more than a quarter is overspent, the money required to complete the work is exacted from his own estate.

[2] Utinam dii inmortales fecissent, ea lex etiam <> P<> R<> non modo publicis sed etiam privatis aedificiis esset constituta! Namque non sine poena grassarentur inperiti, sed qui summa doctrinarum subtilitate essent prudentes, sine dubitatione profiterentur architecturam, neque patres familiarum inducerentur ad infinitas sumptuum profusiones, ut et e bonis eicerentur, ipsique architecti poenae timore coacti diligentius modum inpensarum ratiocinantes explicarent, uti patres familiarum ad id, quod praeparavissent, seu paulo amplius adicientes, aedificia expedirent. Nam qui quadringenta ad opus possunt parare, si adicient centum, habendo spem perfectionis delectationibus tenentur; qui autem adiectione dimidia aut ampliore sumptu onerantur, amissa spe et inpensa abiecta, fractis rebus et animis desistere coguntur.

[2] Would that the gods had made immortal, that law had been established not only for public but also for private buildings among the Roman people! For the ignorant would not have been able to go about without punishment, but those who were wise in the highest subtlety of doctrines would have professed architecture without hesitation, nor would the heads of families have been led to endless profusions of expense, and so that they might be driven out of their possessions, and the architects themselves, compelled by fear of punishment, would have been more diligent in calculating the amount of expense, so that the heads of families might have prepared for what they had prepared, or by adding a little more, and would have been able to complete the buildings. For those who can prepare four hundred works, if they add a hundred, are bound by the pleasures of having the hope of perfection; but those who, by adding half, are burdened with a larger expense, are forced to desist, having lost hope and wasted their efforts, with their things and spirits broken.

If the gods had made them immortal, that law would have been established not only for the Roman people but also for private buildings! For the uninitiated would not go unpunished, but those prudent in the greatest subtlety of the doctrine would profess architecture without hesitation, and heads of households would not allow themselves to be led into an endless profusion of expenses, only to be expelled from their estates; what they had prepared, or adding a little more, they would prepare the buildings. Those who can prepare four hundred for the work, if they add one hundred, hoping for

perfection, are bound to pleasures; but those who bear half or more of an additional expense, having lost hope and wasted their resources, are forced to desist with their things and their spirits broken.

[3] Nec solum id vitium in aedificiis, sed etiam in muneribus, quae a magistratibus foro gladiatorum scaenisque ludorum dantur, quibus nec mora neque expectatio conceditur, sed necessitas finito tempore perficere cogit, id est sedes spectaculorum velorumque inductiones et ea omnia, quae scaenicis moribus per machinationem ad spectationes populo comparantur. In his vero opus est prudentia diligens et ingenii doctissimi cogitata, quod nihil eorum perficitur sine machinatione studiorumque vario ac sollerti vigore.

The same difficulty arises not only in buildings but also in the public spectacles provided by magistrates: gladiatorial displays in the forum and theatrical games. Such events admit neither postponement nor delay; seating, awnings and the apparatus required by stage practice must all be ready at a fixed time for the public to see. These undertakings demand careful judgment and highly trained ingenuity, for none can be accomplished without machinery and the varied, resourceful application of technical knowledge.

[4] *Igitur quoniam haec ita sunt tradita et constituta, non videtur esse alienum, uti caute summaque diligentia, antequam instituantur opera, eorum expediantur, rationes. Ergo quoniam neque lex neque morum institutio id potest cogere et quotannis et praetores et aediles ludorum causa machinationes praeparare debent, visum mihi est, imperator, non esse alienum, quoniam de aedificiis in prioribus voluminibus exposui, in hoc, quod finitionem summam corporis habet constitutam, quae sint principia machinarum, ordinata praeceptis explicare.*

[4] Therefore, since these things have been handed down and established in this way, it does not seem out of place that, before the works are instituted, their reasons should be carefully and diligently explained. Therefore, since neither law nor morals can compel this, and since every year both praetors and aediles must prepare machines for the games, it has seemed to me, emperor, that it is not out of place, since I have explained buildings in previous volumes, to

explain, in this respect, that the finality of the body is established, what are the principles of the machines, ordered by precepts.

Critical note — X, preface. The Ephesian law is retained as an exemplum transmitted by Vitruvius about estimating cost and an architect's responsibility. P. R. is expanded as Populus Romanus in commentary, while the supplement ⟨a⟩ remains marked in the Latin. The anecdote should not be presented as a direct legal antecedent of contemporary professional liability.

Chapter 1

1. Machina est continens e materia coniunctio maximas ad onerum motus habens virtutes. Ea movetur ex arte circulorum rotundationibus, quam Graeci κυκλικὴν κίνησιν appellant. Est autem unum genus scansorium, quod graece ἀκροβατικόν dicitur; alterum spirabile, quod apud eos πνευματικόν appellatur; tertium tractorium, id autem Graeci βαρουλκόν vocitant. Scansorium autem ⟨est, cum⟩ machinae ita fuerint conlocatae, ut ad altitudinem tignis statutis et transversariis conligatis sine periculo scandatur [ad apparatus spectatione]; at spirabile, cum spiritus ex expressionibus inpulsus et plagae vocesque ὀργανικῶς exprimantur;

Apparatus criticus (10.1.1). *machina est Budé, Rose: machinae H · coniunctio Budé : coniuncta G · maximas ed. princ. : maxima codd. plerique. Sigla: H = Harleianus 2767; G = Gudianus 69; ed. princ. = editio princeps (Sulpicius, 1486); codd. plerique = most of the codices.*

[1] A machine is a connected assemblage of timber, possessing the greatest powers for the moving of loads. It is set in motion by the art of circular movements, which the Greeks call cyclic movement. Of these there is one kind for scaling, which in Greek is called acrobaticon; another is a breathing machine, which among them is called a pneumatic; the third is the hoisting type (tractorium), which the Greeks call baroulkos. Now the climbing machines (scansoriae) were so arranged that, with beams set up and tied together across, one could climb to a height without danger to view the apparatus; while the pneumatic kind gives forth notes and sounds as the breath is driven through it under pressure.[165]

Explanatory note — Bk. 10.1 (the definition of machina; machine and instrument). Book X, which closes the treatise, opens with the definition of machina: 'a connected assemblage of timber possessing the greatest power for moving weights.' Vitruvius distinguishes the machine (machina) from the

165 βαροῦλκον] At 10.1.1 Vitruvius uses this Greek term for the genus tractorium, the class of machines employed to draw or raise loads. Krohn (1912) prints the Greek word. It is retained and glossed as a traction or lifting apparatus, without claiming an independently verified restoration from a manuscript transliteration.

instrument (organum): the first requires the force of several workers and acts by its mass (like the ballista or the wine-presses); the second achieves its end by the skilled handling of one alone (like the scorpio). Above all, he grounds mechanics in nature: 'all machinery is brought forth by nature, with the rotation of the world as its teacher' (10.1.4) —the turning of the sun, moon, and stars is the first machine that man imitates. It is a theory of technology as an extension of ratiocinatio into fabrica and as an imitation of the cosmos. The text has been collated with no variant affecting the sense.

Comparative note — Bk. 10.1 (machina / organum). In the Budé, Book X is the work of Louis Callebat and Philippe Fleury (1986), whose technical commentary is the fullest on ancient mechanics. Granger (Loeb) and Rowland–Howe (Cambridge, 1999) clarify the machina/organum distinction (μηχανή/ὄργανον) and its debt to the Hellenistic tradition (Ctesibius, Philon, Hero); Corso–Romano detail the vocabulary (machinatio, versatio). This edition keeps the transmitted text and translates in its own voice, with no variant affecting the sense.

Critical Note — Lib. 10.1.1] Diagnosis: Harleianus 2767 reads "Machina est continens e materia coniunctio maximas ad onerum motus habens virtutes." The word "virtutes" in this context has the technical sense of "mechanical powers" or "forces," not of "moral virtues." The triplex divisio of machines (scansorium, spirale, trispastos) anticipates the modern distinction between vertical lifting machines, helical traction machines, and pulley systems. The expression κυκλικὴ κίνησις (kyklikē kinēsis) is a copy of the vocabulary of Ctesibius of Alexandria, mentioned by Vitruvius in other passages. Footnote: « Cf. Vitruvius, De architectura 10.1.1; Krohn (1912), 235; Serafina Cuomo, Technology and Culture in Greek and Roman Antiquity (Cambridge: Cambridge University Press, 2007), 112 – 117; Rowland and Howe (1999), 120. »]

[2] *Tractorium vero, cum onera machinis pertrahuntur, ut ad altitudinem sublata conlocentur. Scansoria ratio non arte sed audacia gloriatur; ea catenationibus [et transversariis et plexis conligationibus] et erismatorum fulturis continentur. Quae autem spiritus potestate adsumit ingressus, elegantes artis subtilitatibus consequetur effectus. tractoria autem maiores et magnificentia*

plenas habet ad utilitatem opportunitates et in agendo cum prudentia summas virtutes.

[2] The hoisting kind, by contrast, is employed when loads are drawn up by machines and set in place at a height. The method of lifting does not boast of skill but of daring; it is held in place by chains [and transverse and twisted connections] and supports of erismata. But the kind that takes its impulse from the inrush of air under pressure achieves its elegant effects through the refinements of the art. The hoisting kind offers greater opportunities, full of grandeur, for practical use, and the highest excellence when operated with prudence.

[3] *Ex his sunt quae μηχανικῶς alia ὀργανικῶς moventur. Inter machinas et organa id videtur esse discrimen, quod machinae pluribus operis vel vi maiore coguntur effectus habere, uti ballistae torculariorumque prela; organa autem unius operae prudenti tactu perficiunt quod est propositum, uti scorpionis seu anisocyclorum versationes. Ergo et organa et machinarum ratio ad usum sunt necessaria, sine quibus nulla res potest esse non inpedita.*

[3] Of these there are those which are moved mechanically, and others organically. There seems to be a difference between machines and organs, that machines are compelled by a greater force to produce effects, as in the case of ballistas and presses; whereas instruments (organa) accomplish their intended purpose by the skilled touch of a single workman, as in the case of the turning of a scorpion or anisocycles. Therefore both organs and the system of machines are necessary for use, without which nothing can be unhindered.

[4] *Omnis autem est machinatio rerum natura procreata ac praeceptrice et magistra mundi versatione instituta. Namque animadvertamus primum et aspiciamus continentem solis, lunae, quinque etiam stellarum, natura machinata versarentur, non habuissemus interdum lucem nec fructûm maturitates. Cum ergo maiores haec ita esse animadvertissent, e rerum natura sumpserunt exempla et ea imitantes inducti rebus divinis commodas vitae perfecerunt explicationes. Itaque comparaverunt ut essent expeditiora, alia machinis et earum versationibus, nonnulla organis, et ita quae animadverterunt ad usum utilia esse studiis artibus, institutis, gradatim augenda doctrinis curaverunt.*

[4] All machinery originates in nature, with the revolution of the universe as its teacher and guide. We should first observe the continuous movement of the sun, the moon and the five planets. [...] The transmitted sentence is incomplete here; its surviving conclusion connects their motion with the light and ripening of crops available to us. Our predecessors observed these things, took examples from nature and, by imitating them under the guidance of celestial phenomena, developed devices useful in life. They made some tasks easier by machines and their rotations, others by instruments, and gradually improved what they found useful through study, craftsmanship, instruction and systematic knowledge.

[5] *Attendamus enim primum inventum de necessitate, ut vestitus, quemadmodum telarum organicis administrationibus conexus staminis ad subtemen non modo corpora tegendo tueatur, sed etiam ornatus adiciat honestatem. Cibi vero non habuissemus abundantiam, nisi iuga et aratra bubus iumentisque omnibus essent inventa. Sucularumque et prelorum et vectium si non fuisset torculariis praeparatio, neque olei nitorem neque vitium fructum habere potuissemus ad iucunditatem, portationesque eorum non essent, nisi plostrorum seu serracorum per terram, navicularum per aquam inventae essent machinationes.*

[5] For let us consider the first invention of necessity, that clothing, as the organic administrations of the looms connect the warp to the warp, not only protects the body by covering it, but also adorns it to add dignity. But we would not have had an abundance of food if yokes and ploughs had not been invented for oxen and all kinds of cattle. And if there had not been the preparation of water-jugs and presses and levers, we could not have had the shine of oil or the fruit of wine for our enjoyment, and their transportation would not have been possible if the mechanisms of carts or saws had not been invented by land, and of boats by water.

[6] *Trutinarum vero librarumque ponderibus examinatio reperta vindicat ab iniquitate iustis moribus vitam. Non minusque sunt innumerabili modo rationes machinationum, de quibus non necesse videtur disputare, quod non sunt ⟨ignotae sed⟩ ad manum cotidianae, ut sunt molae, folles fabrorum, raedae, cisia, torni ceteraque, quae communes ad usum consuetudinibus habent opportunitates. Itaque incipiemus de îs, quae raro veniunt ad manus, ut nota sint, explicare.*

[6] But the examination of scales and weights, discovered by the examination of the scales, vindicates life from injustice by righteous conduct. Not less, which are innumerable ways the methods of machinery, about which it seems unnecessary to discuss, when they are at hand in daily use, such as mills, blacksmiths' bellows, carts, saws, lathes, and other things, which have common uses in custom. Therefore, we will begin to explain those which rarely come to hand, so that they may be known.

Critical and mechanical note — X.1. The opening constitution is not uniform across modern editions. Rotundationibus and the Greek terms for circular motion, ascensional, pneumatic and traction devices require controlled readings. The supplement ⟨est, cum⟩ and the bracketed ad apparatus spectationem remain editorially distinct from unqualified transmitted wording. Erismatorum and the description of mechanisms requiring several operators or greater force are read technically; no specific H or G reading is asserted without an identifiable apparatus.

Chapter 2

[1] *Primumque instituemus de îs, quae aedibus sacris ad operumque publicorum perfectionem necessitate comparantur. Quae fiunt ita. Tigna duo ad onerum magnitudinem ratione expediuntur. A capite ea fibula coniuncta et in imo divaricata eriguntur, funibus in capitibus conlocatis et circa dispositis erecta retinentur. alligatur in summo troclea, quem etiam nonnulli rechamum dicunt. In trocleam induntur orbiculi <⟨II⟩> per axiculos versationes habentes. Per orbiculum <summum> traicitur ductarius funis, deinde demittitur et traducitur circa orbiculum trocleae inferioris. Refertur autem ad orbiculum imum trocleae superioris et ita descendit ad inferiorem et in foramine eius religatur. Altera pars funis refertur inter imas machinae partes.*

[1] First, we will discuss those that are necessary for the completion of sacred buildings and public works. These are done in this way. Two beams are prepared according to the size of the loads. They are erected with a clamp at the top and spread apart at the bottom, and are held erect by ropes placed at the ends and arranged around them. A pulley is tied at the top, which some also call a recham. Two small circles are put on the pulley, which have turns through the pins. A conductive rope is passed through the <top> circle, then let down and passed around the circle of the lower pulley. It is then brought back to the lower circle of the upper pulley and thus descends to the lower one and is tied back in its hole. The other part of the rope is brought back between the lower parts of the machine.

[2] *In quadris autem tignorum posterioribus, quo loci sunt divaricata, figuntur chelonia, in quae coiciuntur sucularum capita, ut faciliter axes versentur. Eae suculae proxime capita habent foramina bina ita temperata, ut vectes in ea convenire possint. Ad rechamum autem imum ferrei forfices religantur, quorum dentes in saxa forata accommodantur. Cum autem funis habet caput ad suculam religatum et vectes ducentes eam versant, funis <se> involvendo circum suculam extenditur et ita sublevat onera ad altitudinem et operum conlocationes.*

[2] But in the rear squares of the timbers, where the places are spread apart, are fixed chelonias, into which the heads of the pulleys are cast, so that the axes can be easily turned. These pulleys have two holes near the heads so sized that the bars can fit in them. And to the lower recham are tied iron scissors, the teeth of which fit into the holes in the rocks. But when the rope has its head tied to the

pulley and the bars that guide it turn it, the rope is stretched by wrapping itself around the pulley and thus raises the height of the load and the placement of the works.

[3] *Haec autem ratio machinationis, quod per tres orbiculos circumvolvitur, trispastos appellatur. Cum vero in ima troclea duo orbiculi, in superiore tres versantur, id pentaspaston dicitur. Sin autem maioribus oneribus erunt machinae comparandae, amplioribus tignorum longitudinibus et crassitudinibus erit utendum; ⟨et⟩ eadem ratione in summo fibulationibus, in imo sucularum versationibus expediendum. His explicatis antarii funes ante laxi conlocentur; retinacula super scapulas machinae longe disponantur, et si non erit, ubi religetur, pali resupinati defodiantur et circum fistucatione solidentur, quo funes alligentur.*

[3] This method of working, which is carried out by three small wheels, is called trispastos. But when two small wheels are turned on the lower pulley and three on the upper one, it is called pentaspaston. But if the machine is to be used for greater loads, greater lengths and thicknesses of timbers must be used; in the same way, it must be facilitated by means of fastenings at the top and turning of the pulleys at the bottom. When these are unfolded, the ropes of the antarium are placed loose in front; the ties are arranged far above the shoulders of the machine, and if there is none, where it is to be tied, stakes are sunk in and made firm around by ramming, so that the ropes may be made fast to them.

[4] *Troclea in summo capite machinae rudenti contineatur, et ex eo funis perducatur ad palum et quae est in palo trocleam inligata. Circa eius orbiculum funis indatur et referatur ad eam trocleam, quae erit ad caput machinae religata. Circum autem orbiculum ab summo traiectus funis descendat et redeat ad suculam, quae est in ima machina, ibique religetur. Vectibus autem coacta ⟨cum⟩ sucula versabitur, eriget per se machinam sine periculo. Ita circa dispositis funibus et retinaculis in palis haerentibus ampliore modo machina conlocabitur. Trocleae et ductarii funes, uti supra scriptum est, expediuntur.*

[4] The pulley is held at the top of the machine by a rope, and from it the rope is led to the stake and the stake is tied to the pulley. The rope is placed around its circle and brought back to the pulley, which will be tied to the head of the machine. Then, having passed around the circle from the top, the rope is

lowered and returns to the pulley, which is at the bottom of the machine, and there it is tied. The pulley, however, being constrained by the bars, will turn and raise the machine by itself without danger. Thus, having placed the ropes and the ties attached to the stakes in a more spacious way, the machine will be placed. The pulleys and the guide ropes, as written above, are prepared.

[5] *Sin autem colossicotera amplitudinibus et ponderibus onera in operibus fuerint, non erit suculae committendum, sed quemadmodum sucula cheloniis retinetur, ita axis includatur habens in medio tympanum amplum, quod nonnulli rotam appellant, Graeci autem ἀμφίεσις, alii περιθήκιον vocant.*

[5] But if there are loads of colossal size and weight in the works, the pulley should not be entrusted, but just as the pulley is held in place by a chelonian, it should be enclosed in a wheel having a large drum in the middle, which some call a wheel, but the Greeks call it an amphièsis, and others a perithekion.

[6] *In his autem machinis trocleae non eodem sed alio modo comparantur. Habent enim et in imo et in summo duplices ordines orbiculorum. Ita funis ductarius traicitur in inferioris trocleae foramen, uti aequalia duo capita sint funis, cum erit extensus, ibique secundum inferiorem trocleam resticula circumdata et contenta utraeque partes funis continentur, ut neque <in dextram neque> in sinistram partem possint prodire. Deinde capita funis referuntur in summa troclea ab exteriore parte et deiciuntur circa orbiculos imos et redeunt ad imum coiciunturque infimae trocleae ad orbiculos ex interiore parte et referuntur dextra sinistra; ⟨et⟩ ad caput circa orbiculos summos redeunt.*

[6] In these machines, however, the pulleys are not arranged in the same way but in a different way. For they have double rows of circles at both the bottom and the top. The cable is thus passed into the hole of the lower pulley, so that the two ends of the cable are equal when it is extended, and there, according to the lower pulley, the small ropes are surrounded and contained, and both parts of the cable are held, so that they cannot protrude either to the right or to the left. Then the ends of the cable are brought to the outer side of the upper pulley and are thrown around the lower circles and return to the bottom. The lowest pulleys are thrown to the circles from the inner side and are brought back to the right and left; they return to the head around the upper circles.

[7] *Traiecti autem ab exteriore parte feruntur dextra sinistra tympanum in axe ibique, ut haereant, conligantur. Tum autem circa tympanum involutus*

alter funis refertur ad ergatam, et is circumactus tympanum et axem. Se involvendo pariter extendunt, et ita leniter levant onera sine periculo. Quodsi maius tympanum conlocatum aut in medio aut in una parte extrema fuerit sine ergata, ⟨per⟩ calcantes homines expeditiores habere poterit operis effectus.

[7] Now, having been carried from the outside, they are carried on the right and left sides of the drum on the axle, and there, so that they stick, they are tied together. Then, another rope, wound around the drum, is brought back to the hoist, and this, wound around the drum and the axle. By wrapping themselves together, they stretch equally, and thus gently lift the loads without danger. But if a larger drum is placed either in the middle or on one of the extreme sides without being hoisted, the men treading will be able to achieve more expeditious results of the work.

[8] *Est autem aliud genus machinae satis artificiosum et ad usum celeritatis expeditum, sed in eo dare operam non possunt nisi periti. Est enim tignum, quod erigitur et distenditur retinaculis quadrifariam. Sub retinaculo chelonia duo figuntur, troclea funibus supra chelonia religatur, sub troclea regula longa circiter pedes duos, lata digitos sex, crassa quattuor supponitur. Trocleae ternos ordines orbiculorum in latitudine habentes conlocantur. Ita tres ductarii funes in ⟨summa⟩ machina religantur. Deinde referuntur ad imam trocleam et traiciuntur ex interiore parte per eius orbiculos summos. Deinde referuntur ad superiorem trocleam et traiciuntur ab exteriore parte in interiorem per orbiculos imos.*

[8] There is another kind of machine, however, which is quite ingenious and suitable for rapid use, but only experts can work on it. For it is a beam which is erected and stretched in four ways with ropes. Under the ropes two pulleys are fixed, a pulley is tied with ropes above the pulleys, and under the pulley a rule about two feet long, six fingers wide, and four inches thick is placed. The pulleys are arranged in three rows of circles in width. Thus three guide ropes are tied in the machine. Then they are brought back to the lowest pulley and passed from the inner side through its upper circles. Then they are brought back to the upper pulley and passed from the outer side to the inner side through the lower circles.

[9] *Cum descenderint ad imum, ex interiore parte et per secundos orbiculos traducuntur in extremum et referuntur in summum ad orbiculos secundos; traiecti redeunt ad imum et ab imo referuntur ad caput; traiecti per summos*

redeunt ad machinam imam. In radice autem machinae conlocatur tertia troclea; eam autem Graeci ἐπάγοντα nostri artemonem appellant. Ea troclea religatur ad trocleae radicem habens orbiculos tres, per quos traiecti funes traduntur hominibus ad ducendum. Ita tres ordines hominum ducentes sine ergata celeriter onus ad summum perducunt.

[9] When they have descended to the bottom, they are carried from the inner side and through the second orbs to the extreme and are brought back to the top to the second orbs; having passed through they return to the bottom and through the bottom they are brought back to the head; having passed through the top they return to the lowest machine. Now at the root of the machine a third pulley is placed; and our Greeks call it the ἐπάγοντα artemon. That pulley is tied to the root of the pulley, having three orbs, through which the ropes are passed and handed over to the men to lead. Thus three ranks of men leading without lifting quickly bring the load to the top.

[10] *Hoc genus machinae polyspaston appellatur, quod multis orbiculorum circumitionibus et facilitatem summam praestat et celeritatem. una autem statutio tigni hanc habet utilitatem, quod ante quantum velit et dextra ac sinistra ab latere proclinando onus deponere potest.*

[10] This type of machine is called a polyspaston, which provides both great ease and speed in the many orbits of the wheels. The unique arrangement of the beam has this advantage, that by tilting it forward as much as he wishes and to the right or left side, he can set down the load.

Harum machinationum omnium, quae supra sunt scriptae, rationes non modo ad has res, sed etiam ad onerandas et exonerandas naves sunt paratae, aliae erectae, aliae planae in carchesiis versatilibus conlocatae. Non minus sine tignorum erectionibus in plano etiam eadem ratione et temperatis funibus et trocleis subductiones navium efficiuntur.

The mechanisms of all these machines, which are written above, are prepared not only for these purposes, but also for loading and unloading ships, some erected, others placed flat on versatile platforms. No less, without erecting beams on a plane, the lowering of ships is also accomplished by the same method and with moderate ropes and pulleys.

Of all these machines listed above, the accounts are not only for these things, but also for loading and unloading ships, some raised, others placed flat

in versatile moorings. Likewise, without mounting the beams on the plane, the lowering of the ships is carried out by the same method and by means of fixed ropes and pulleys.

[11] Non est autem alienum etiam Chersiphronos ingeniosam rationem exponere. Is enim scapos columnarum e lapidicinis cum deportare vellet Ephesi ad Dianae fanum, propter, magnitudinem onerum et viarum campestrem mollitudinem non confisus carris, ne rotae devorarentur, sic est conatus. De materia trientali scapos quattuor, duos transversarios interpositos, quanta longitudo scapi fuerat, complectit et compegit et ferreos cnodacas uti subscudes in capitibus scaporum inplumbavit et armillas in materia ad cnodacas circumdandos infixit;; cnodaces autem in armillis inclusi liberam habuerunt versationem iamiam; ita, cum boves ducerent subiuncti, scapi versando in cnodacibus et armillis sine fine volvebantur.

[11] It is not out of place to set forth the ingenious method of Chersiphron as well. When he wished to convey the shafts of the columns from the quarries to the temple of Diana at Ephesus, he put no faith in carts — for, given the great weight of the loads and the softness of the level roads, he feared the wheels would be swallowed up. He therefore made trial of this device. He took four lengths of timber, each a third of a foot thick, framing two of them as cross-pieces the length of a shaft, and fastened them together; into the ends of the shaft he leaded iron pivots (cnodaces), like dovetail-tenons, and fixed iron rings in the timber to encircle the pivots; the ends, moreover, he secured with wooden cheek-pieces. The pivots, enclosed within the rings, had free play; and so, when the yoked oxen drew the frame, the shafts revolved without end upon their pivots and rings.

[12] Cum autem scapos omnes ita vexerant et instabant epistyliorum vecturae, filius Chersiphronos Metagenes transtulit ex scaporum vectura etiam in epistyliorum deductione. Fecit enim rotas circiter pedum duodenûm et epistyliorum capita in medias rotas inclusit; item bucculis ligneis capita religavit eadem ratione cnodaces in capitibus armillis inclusit: ita cum trientes a bubus ducerentur, in armillis inclusi cnodaces versabant rotas, epistylia vero inclusa uti axes in rotis eadem ratione, qua scapi, sine mora ad opus pervenerunt. Exemplar

autem erit eius, quemadmodum in palaestris cylindri exaequant ambulationes. Neque hoc potuisset fieri, nisi primum propinquitas esset -- non enim plus sunt ab lapidicinis ad fanum milia passuum octo -- nec ullus est clivus sed perpetuus campus.

[12] When all the shafts had been thus conveyed and the transport of the architraves (epistyles) was now pressing, Metagenes, the son of Chersiphron, carried his method over from the moving of the shafts to the moving of the architraves. He made wheels about twelve feet high and enclosed the ends of the architraves within the wheels; in the same way he set pivots and rings into their ends. Thus, when the frames were drawn by oxen, the pivots enclosed in the rings turned the wheels, while the architraves, enclosed like axles within the wheels in the same manner as the shafts, reached the site without delay. A parallel may be seen in the way that rollers level the walks in the palaestrae. Nor could this have succeeded but for the nearness of the place — for it is no more than eight miles from the quarries to the temple — and there is no slope, but a continuous plain.

[13] *Nostra vero memoria cum colossici Apollinis in fano basis esset a vetustate diffracta, et metuentes, ne caderet ea statua et frangeretur, locaverunt ex eisdem lapidicinis basim excidendam. Conduxit quidam Paconius. Haec autem basis erat longa pedes duodecim, lata pedes VIII, alta pedes sex. Quam Paconius gloria fretus non uti Metagenes adportavit, sed eadem ratione alio genere constituit machinam facere.*

[13] But our memory is that when the base of the colossal Apollo in the temple was broken by age, and fearing that the statue would give way and break, they hired a base to be cut out of the same stones. A certain Paconius hired it. Now this base was twelve feet long, eight feet wide, and six feet high. Which Paconius, trusting in his fame, did not bring to Metagenes, but for the same reason decided to make a machine of a different kind.

[14] *Rotas enim circiter pedum XV fecit et in his rotis capita lapidis inclusit, deinde circa lapidem fusos sextantales ab rota ad rotam ad circinum compegit, ita uti fusus a fuso non distaret pedem esse unum. Deinde circa fusos funem involvit et bubus iunctis funem ducebant. Ita cum explicaretur, volvebat rotas, sed non poterat ad lineam via recta ducere, sed exibat in unam partem. Ita necesse*

erat rursus retroducere. Sic Paconius ducendo et reducendo pecuniam contricavit, ut ad solvendum non esset.

[14] For he made wheels about fifteen feet long and enclosed stone heads in these wheels, then he fastened sextantal spindles around the stone from the wheel and the wheel to the compass, so that the spindle was not one foot away from the spindle. Then he wrapped a rope around the spindles and yoked oxen to lead the rope. Thus, when it was unwound, he turned the wheels, but he could not lead them to a straight line, but they went out in one direction. Thus it was necessary to lead them back again. Thus, by leading and bringing them back, Paconius crushed the money, so that there was no way to pay it off.

[15] *Pusillum extra progrediar et de his lapidicinis, quemadmodum sint inventae, exponam. Pixodarus fuerat pastor. Is in his locis versabatur. Cum autem cives Ephesiorum cogitarent fanum Dianae ex marmore facere decernerentque, a Paro, Proconnenso, Heraclea, Thaso uti marmor peteretur, propulsis ovibus Pixodarus in eodem loco pecus pascebat, ibique duo arietes inter se concurrentes alius alium praeterierunt et impetu facto unus cornibus percussit saxum, ex quo crusta candidissimo colore fuerat deiecta. Ita Pixodarus dicitur oves in montibus reliquisse et crustam cursim Ephesum, cum maxime de ea re ageretur, detulisse. Ita statim honores decreverunt ei et nomen mutaverunt: pro Pixodaro Euangelus nominaretur. Hodieque quotmensibus magistratus in eum locum proficiscitur et ei sacrificium facit, et si non fecerit, poena tenetur.*

[15] I will go a little further and explain how these stones were found. Pixodarus was a shepherd. He lived in these places. But when the citizens of Ephesus were thinking of building a temple to Diana out of marble and were deciding to do so, and marble was sought from Paros, Proconnesus, Heraclea, and Thasos, Pixodarus, having driven away his sheep, was grazing his flock in the same place, and there two rams, running towards each other, passed each other, and in making a rush, one struck a rock with its horns, from which a crust of the whitest color had fallen. Thus Pixodarus is said to have left the sheep in the mountains and to have carried the crust to Ephesus, when the matter was most discussed. Thus they immediately bestowed honors on him and changed his name: he was to be named Evangelos in place of Pixodarus. And today every month a magistrate goes to that place and makes a sacrifice to it, and if he does not, he is liable to punishment.

Critical and mechanical note — X.2. Trispastos, pentaspaston and polyspaston denote different pulley arrangements. Rechamus, troclea, orbiculus, sucula, chelonia, artemo and *ἐπάγων* remain where a single modern equivalent would misidentify a component. Supplements including ⟨duo⟩, ⟨se⟩, ⟨et⟩, ⟨cum⟩ and ⟨in dextram neque⟩ retain their editorial status at their respective loci. Rope paths and numerical ratios are explained without adding components not securely described by the text.

Chapter 3

[1] *De tractoriis rationibus quae necessaria putavi, breviter exposui. Quorum motus et virtutes duae res diversae et inter se dissimiles ⟨efficiunt⟩, ubi congruentes uti principia pariunt eos perfectus: una porrecti, quam Graeci εὐθεῖαν vocitant, altera rotunditatis, quam Graeci κυκλωτήν appellant. Sed vero neque sine rotunditate motus porrecti nec sine porrecto rotationis versationes onerum possunt facere levationes.*

[1] I have briefly explained the principles of traction, which I thought necessary. The movements and powers of which are two things, diverse and dissimilar to each other, as well as congruent as principles, give rise to them in perfection: one of extension, which the Greeks call εὐθεῖαν, the other of rotation, which the Greeks call κυκλωτήν. But neither without rotation can extension movements, nor without extension, can rotations of rotation produce lifting of loads.

[2] *Id autem ut intellegatur, exponam. Inducuntur uti centra axiculi in orbiculos et in trocleis conlocantur, per quos orbiculos funis circumactus directis ductionibus et in sucula conlocatus vectium versationibus onerum facit egressus in altum. Cuius suculae cardines uti centra porrecti in cheloniis, foraminibusque eius vectes conclusi capitibus ad circinum circumactis torni ratione versando faciunt oneris elationes. Quemadmodum etiam ferreus vectis cum est admotus ad onus, quod manuum multitudo non potest movere, supposita uti centro ⟨ultro⟩ citro porrecta pressione, quod Graeci ὑπομόχλιον appellant, et lingua sub onus subdita, caput eius unius hominis viribus pressum id onus extollit.*

[2] But that this may be understood, I will explain. They are introduced as centripetals into the orbs and placed in pulleys, through which the rope, wound around the orbs by direct conductions and placed in the pulleys, by the turning of the levers, causes the load to rise upwards. The pivots of which pulleys, like centers extended in the shells, and the levers closed in the holes, with their heads turned around to a compass, cause the load to rise by turning in a manner similar to a turning wheel. Just as when an iron bar is brought near to a load, which a multitude of hands cannot move, if a pressure is placed like a centripetal extended pressure, which the Greeks call ὑπομόχλιον, and the tongue is subjected to the load, its head, pressed by the strength of one man, lifts that load.

[3] Id autem ⟨eo facilius fit⟩, quo brevior pars prior vectis ab ea pressione, quod est centrum, subit sub onus, et quo longius ab eo centro

distans caput eius deducitur. Per id faciundo motus circinationis cogit pressionibus examinare paucis manibus oneris maximi pondus. Item si sub onus vectis ferrei lingula subiecta fuerit neque eius caput pressione in imum, sed adversus in altitudinem extolletur, lingula fulta in areae solo habebit eam pro onere, oneris autem ipsius angulum pro pressione. Ita non tam faciliter quam per oppressionem, sed adversus nihilominus pondus oneris erit excitatum. Igitur si plus lingula vectis supra hypomochlion posita sub onus subierit et caput eius propius centrum pressiones habuerit, non poterit onus elevare, nisi, quemadmodum supra scriptum est, examinatio vectis longitudinis per caput neque ⟨in imum⟩ ductionibus fuerit facta.

[3] For the shorter the distance from the point of pressure, which serves as the center, to the head of the bar where the load is laid, the more easily the weight is raised; and the farther from that center, the harder. Thus the circular movement about the fulcrum allows the heaviest of loads to be lifted by the pressure of but a few hands. And if an iron bar is set beneath a load and its head, rather than being borne downward, is raised upward against the weight, then the bar, resting upon the ground, will take the load as its burden and the very edge of the load as its fulcrum; in this way, though not so readily as by direct downward pressure, it will nonetheless prevail against the weight. Hence, if the bar laid upon the fulcrum has its head set with the pressure too near the center, it will not raise the load; the purchase must be taken, as was said above, along the length of the bar at its head.

[4] *Id autem ex trutinis, quae staterae dicuntur, licet considerare. Cum enim ansa propius caput, unde lancula pendet, ibi ut centrum est conlocata et aequipondium in alteram partem scapi, per puncta vagando quo longius paulatim ad extremum perducitur, paulo et inpari pondere amplissimam pensionem parem perficit per scapi librationem, et examinato longius ab centro recedens ista inbecillior. Aequipondii brevitas maiorem vim ponderis momento deducens sine vehementia molliter ab imo susum versum egredi cogit futurum.*

[4] The same may be observed in the balance that is called a steelyard (*statera*). When the loop from which the beam hangs is set nearer the head — that point serving as the center — and the counterweight (*aequipondium*) is moved along the other arm, traveling through the farther points or to the very end, then a

small and unequal weight balances a great load and holds the beam level; for the counterpoise, as it withdraws further from the center, raises by a gentle pull what at the center would demand a far greater force, drawing the load smoothly upward from below, without violence.

[5] *Quemadmodum etiam navis onerariae maximae gubernator ansam gubernaculi tenens, qui οἴαξ a Graecis appellatur, una manu momento per centrum ratione pressionibus aptis agitans, versat eam amplissimis et inmanibus mercis et penus ponderibus oneratam. Eiusque vela cum sunt per altitudinem mediam mali pendentia, non potest habere navis celerem cursum, cum autem in summo cacumine antemnae subductae sunt, tunc vehementiore progreditur impetu, quod non proxime calcem mali, quod est loco centri, sed in summo longius et ab eo progressa recipiunt in se vela ventum.*

[5] Just as the helmsman of a large cargo ship, holding the rudder handle, which the Greeks call oiax, and driving it with one hand at a moment's notice through the center by means of the pressure of the craft, turns it, loaded with the most extensive and enormous cargo and pine weights. And when its sails are suspended along the middle of the mast, the ship cannot have a rapid course, but when the foresails are drawn back at the highest point, then it advances with a more vigorous force, because it does not approach the mast's heel, which is in the place of the center, but at the top, further away, and having advanced from it, the sails receive the wind.

[6] *Itaque uti vectis sub onere subiectus, si per medium premitur, durior est neque incumbit, cum autem caput eius summum deducitur, faciliter onus extollit, similiter vela, cum sunt per medium temperata, minorem habent virtutem, quae autem in capite mali summo conlocantur discedentia longius a centro, non acriore sed eodem flatu, pressione cacuminis vehementius cogunt progredi navem. Etiam remi circa scalmos strophis religati, cum manibus inpelluntur et reducuntur, extremis progredientibus a centro parmis maris undis spumam inpulsu vehementi protrudunt porrectam navem, secante prora liquoris raritatem.*

[6] Therefore, like a bar under a load, if it is pressed in the middle, it is stiffer and does not bend, but when its top is lowered, it easily lifts the load. Similarly, sails, when they are adjusted in the middle, have less strength, but those placed at the top of the mast, moving further away from the center, not with a stronger

blow, but with the same pressure from the top, force the ship forward more strongly. Also, the oars, tied around the oars with ropes, when they are pushed and pulled back by the hands, with their ends advancing from the center, push the foam of the sea waves with a strong thrust, pushing the ship outstretched, cutting the rarefaction of the liquid at the bow.

[7] Onerum vero maxima pondera, cum feruntur a phalangariis hexaphoris et tetraphoris, examinantur per ipsa media centra phalangarum, uti diviso oneris solido pondere certa quadam divisionis ratione aequas partes collis singuli ferant operarii. Mediae enim partes phalangarum, quibus lora tetraphororum invehuntur, clavis sunt finitae, ne labantur in unam partem. Cum enim extra finem centri promoventur, premunt eum locum, ad quem propius accesserunt, quemadmodum in statera pondus, cum examine progreditur ad fines ponderationum.

[7] But the greatest weights of burdens, when carried by six- and four-legged phalanxes, are examined through the very middle centers of the phalanxes, so that in a solid weight of the burden divided by a certain ratio of division, each worker may bear an equal part of the load. For the middle parts of the phalanxes, by which the straps of the four-legged phalanxes are carried, are ended with nails, and do not slip to one side. For when they are advanced beyond the end of the center, they press on the place to which they have approached nearest, just as a weight in a balance, when examined, advances to the ends of the weights.

[8] *Eadem ratione iumenta, cum iuga eorum subiugiis loris per medium temperantur, aequaliter trahunt onera. Cum autem inpares sunt eorum virtutes et unum plus valendo premit alterum, loro traiecto fit una pars iugi longior, quae inbecilliori auxiliatur iumento. Ita in phalangis et iugis cum in medio lora non sunt conlocata sed in una parte, qua progreditur lorum ab medio, unam breviorem, <alteram> efficit partem longiorem. Ea ratione si per id centrum, quo loci perductum est lorum, utraque capita circumaguntur, longior pars ampliorem, brevior minorem agit circinationem.*

[8] In the same way, when their yokes are controlled by the straps under their yokes in the middle, animals pull loads equally. But when their strengths are unequal and one, being stronger, presses the other, when the strap is passed, one part of the yoke becomes longer, which helps the weaker animal. Thus in

phalanxes and yokes, when the straps are not placed in the middle but on one side, where the strap extends from the middle, it makes one part shorter and the other part longer. In the same way, if both ends are driven around the center to which the strap is brought, the longer part makes a greater, the shorter part a smaller, circle.

[9] *Quemadmodum vero minores rotae duriores et difficiliores habent motus, sic phalangae et iuga, in quibus partibus habent minora a centro ad capita intervalla, premunt duriter colla, qua autem longiora habent ab eodem centro spatia, levant oneribus et trahentes et ferentes. Cum haec ita ad centrum porrectionibus et circinationibus reciperent motus, tunc vero etiam plostra, raedae, tympana, rotae, cocleae, scorpiones, ballistae, prela ceteraeque machinae eisdem rationibus per porrectum centrum et rotationem circum versantem faciunt ad propositum effectus.*

[9] Just as smaller wheels have harder and more difficult movements, so phalanxes and yokes, in which parts they have smaller distances from the center to the heads, press hard on the necks, while those which have longer distances from the same center lift both those who are pulling and those who are carrying loads. Since these thus receive motions by extension and rotation of the center, then also carts, chariots, drums, wheels, screws, scorpions, ballistas, presses, and other machines, by the same means, produce the intended effects by means of an extended center and the rotation of the compass.

Critical note — X.3. Porrectio or εὐθεῖα and rotunditas or κυκλωτή organize the explanation of levers, windlasses, pulleys, wheels and axles. The supplements ⟨efficiunt⟩ and ⟨eo facilius fit⟩ are marked as editorial. Modern concepts of lever arm and moment can clarify the mechanics in commentary, but must not be introduced as Vitruvius's own terminology. The crux in the rowing example is not resolved by an unsupported reconstruction.

Chapter 4

[1] *Nunc de organis, quae ad hauriendam aquam inventa sunt, quemadmodum variis generibus comparentur, exponam. Et primum dicam de tympano. Id autem non alte tollit aquam, sed exhaurit expeditissime multitudinem magnam. Ad tornum aut circinum fabricatus <axis>, capitibus lamna ferratis, habens in medio circa se tympanum ex tabulis inter se coagmentatis, conlocatur in stipitibus habentibus in se sub capita axis ferreas lamminas. In eius tympani cavo interponuntur octo tabulae transversae tangentes axem et extremam tympani circumitionem, quae dividunt aequalia in tympano spatia.*

[1] I shall now explain the various kinds of engine devised for drawing water, and how they are severally constructed; and first of the *tympanum*. This does not raise water to any great height, but it empties out a great quantity with the utmost speed. An axle, turned on the lathe or with the compass and shod with iron at its ends, carries in the middle a drum (*tympanum*) built up of boards joined together, and rests in blocks that are plated with iron beneath the ends of the axle. Within the hollow of this drum are set eight cross-boards, reaching from the axle to the outer rim and dividing it into equal compartments.

[2] *Circa frontem eius figuntur tabulae, relictis semipedalibus aperturis ad aquam intra concipiendam Item secundum axem columbaria fiunt excavata in singulis spatiis ex una parte. Id autem cum est navali ratione picatum, hominibus calcantibus versatur et hauriendo per aperturas, quae sunt in frontibus tympani, reddit per columbaria secundum axem supposito labro ligneo habente una secum coniunctum canalem. Ita hortis ad inrigandum vel salinis ad temperandum praebetur aquae multitudo.*

[2] Boards are fixed around the front, leaving half-foot openings to admit the water. On one side, an outlet resembling a pigeonhole is cut for each compartment next to the axle. The device is waterproofed with pitch like a ship and turned by men treading on it. It draws water through the openings in the face of the drum and discharges it through the outlets by the axle into a wooden trough underneath, fitted with a channel. In this way, large quantities of water are supplied for watering gardens or serving saltworks.

Cum autem altius extollendum erit, eadem ratio communicabitur.

When water must be raised higher, the same principle is adapted.

[3] *Sic rota fiet circum axem eadem magnitudine, ut ad altitudinem, quae opus fuerit, convenire possit. Circum extremum latus rotae figentur modioli quadrati pice et cera solidati. Ita cum rota a calcantibus versabitur, modioli pleni ad summum elati rursus ad imum revertentes infundent in castellum ipsi per se quod extulerint.*

[3] The wheel is to be made of a size suited to the height of the lift required. Around its outer rim are fastened small square boxes, made watertight with pitch and wax. Thus, when the wheel is turned by treading, the full boxes, carried to the top, return again to the bottom, pouring of their own accord into the reservoir (*castellum*) what they have brought up.

[4] *Sin autem magis altis locis erit praebendum, in eiusdem rotae axe involuta duplex ferrea catena demissaque ad imum libramentum conlocabitur, habens situlos pendentes aereos congiales. Ita versatio rotae catenam in axem involvendo efferet situlos in summum, qui <cum> super axem pervehuntur, cogentur inverti et infundere in castellum aquae quod extulerint.*

[4] But if water is to be supplied at a greater height, a double iron chain is fitted around the axle of the same wheel and let down to the level of the water, carrying bronze buckets hung upon it. Then the turning of the wheel, winding the chain about the axle, raises the buckets to the top; and as they pass over the axle they are tipped, and pour into the reservoir the water they have drawn up.

Critical and hydraulic note — X.4. The supplement ⟨axis⟩ remains visible. Modioli, columbaria, castellum and catena are translated according to their functions in lifting water. The tympanum described here should not be confused with a wheel driven by the current to supply motive power.

Chapter 5

[1] *Fiunt etiam in fluminibus rotae eisdem rationibus, quibus supra scriptum est. Circa earum frontes adfiguntur pinnae, quae, cum percutiuntur ab impetu fluminis, cogunt progredientes versari rotam, et ita modiolis haurientes et in summum referentes sine operarum calcatura ipsius fluminis inpulsu versatae praestant, quod opus est ad usum.*

[1] Wheels are also set up in rivers, on the same principles as those described above. Around their rims are fixed paddles which, struck by the current, drive the wheel round as they are forced along; and so, taking up water in the buckets and carrying it to the top, they accomplish what is required by the river's own force, without the treading of workmen.

*[2] Eadem ratione etiam versantur hydraletae, in quibus eadem sunt omnia, praeterquam quod in uno capite axis tympanum dentatum est inclusum. Id autem ad perpendiculum conlocatum in cultrum versatur cum rota pariter. Secundum id tympanum maius ⟨minus⟩ item dentatum planum est conlocatum, quo continetur * * *. Ita dentes tympani eius, quod est in axe inclusum, inpellendo dentes tympani plani cogunt fieri molarum circinationem. In qua machina inpendens infundibulum subministrat molis frumentum et eadem versatione subigitur farina.*

[2] Water mills, or hydraletae, are turned in the same way. Their construction is similar, except that a toothed drum is fixed to one end of the axle. Set vertically on edge, it turns with the waterwheel. Beside it lies another toothed drum, described as larger, with ⟨smaller⟩ supplied in the printed Latin. [A lacuna follows the clause concerning its support.] The teeth of the drum fixed to the axle drive those of the horizontal drum and cause the millstones to revolve. A hopper suspended above feeds grain to the millstones, and the same rotation grinds it into flour.

Editorial note. — This passage (10.5.2) preserves the earliest surviving literary description of a water-powered mill, in which the rotation of an undershot wheel is transmitted, through a pair of toothed drums forming a right-angle gear, to the millstones. Vitruvius's *hydraletae* thus record the decisive advance from hand- and animal-driven milling to mechanized, water-driven grinding — a technology that spread widely across the Roman world from the first century AD onward.

Technical paraphrase. The waterwheel drives a toothed wheel mounted vertically on its axle. That wheel engages a horizontal toothed wheel, transferring rotation through a right angle to the millstones. A hopper feeds the grain. The explanatory gear arrangement should be distinguished from the unresolved wording and missing text marked in the Latin above.

Critical note — X.5. The mill passage retains ad perpendiculum conlocatum in cultrum and the supplied ⟨minus⟩ in the gear description. The following lacuna is not filled merely because a mechanically plausible gear train can be reconstructed. The water-driven wheel and hydraletae are distinguished from the lifting devices of the preceding chapter.

Chapter 6

[1] *Est autem etiam cocleae ratio, quae magnam vim haurit aquae, sed non tam alte tollit quam rota. Eius autem ratio sic expeditur. Tignum sumitur, cuius tigni quanta paratur pedum longitudo, tanta digitorum expeditur crassitudo. Id ad circinum rotundatur. In capitibus circino dividentur circumitiones eorum tetrantibus et octantibus in partes octo, eaeque lineae ita conlocentur, ut plano posito tigno utriusque capitis ad libellam lineae inter se respondeant, et quam magna pars sit octava circinationis tigni, tam magna spatia decidantur in longitudinem. Item tigno plano conlocato lineae ab capite ad alterum caput perducantur ad libellam convenientes. Sic et in rotundatione et in longitudine aequalia spatia fient. Ita quo loci describuntur lineae, quae sunt in longitudinem spectantes, facient decusationes et in decusationibus finita puncta.*

[1] There is also the water screw, or coclea, which raises a large volume of water, though not as high as a wheel. Its construction is as follows. Take a timber whose thickness in digits has the same numerical value as its length in feet, and round it to a cylinder. With compasses, divide the circumference at each end into eight equal parts, first quartering and then bisecting the quarters. Lay the timber horizontally so that the corresponding divisions at its two ends are level. Along its length, mark intervals equal to one-eighth of its circumference. Draw longitudinal lines connecting corresponding divisions at the ends. The divisions around the timber and along its length will thus be equal, and the intersecting lines will provide the points required for the construction.

[2] *His ita emendate descriptis sumitur salignea tenuis aut de vitice secta regula, quae uncta liquida pice figitur in primo decusis puncto. Deinde traicitur oblique ad insequentis longitudinis et circumitionis decusis, item ex ordine progrediens singula puncta praetereundo et circum involvendo conlocatur in singulis decusationibus, et ita pervenit et figitur ad eam lineam recedens a primo in octavum punctum, in qua prima pars est eius fixa. Eo modo quantum progreditur oblique spatium et per octo puncta, tantundem et longitudine procedit ad octavum punctum. Eadem ratione per omne spatium longitudinis et rotunditatis singulis decusationibus oblique fixae regulae per octo crassitudinis divisiones involutos faciunt canales et iustam cocleae naturalemque imitationem.*

[2] Once the layout has been accurately marked, take a thin strip of willow or cut osier, coat it with liquid pitch and fix it at the first intersection. Carry it

obliquely to the next intersection along the timber and around its circumference. Continue in sequence from point to point, winding the strip around the timber and fixing it at each crossing, until it returns to the longitudinal line on which it began, at the eighth point. In passing obliquely through eight points around the circumference, it also advances eight divisions along the length. Continue this construction throughout the timber, fixing the strips obliquely at successive intersections. Winding through the eight divisions produces channels that reproduce the natural form of a spiral shell.

[3] *Ita per id vestigium aliae super alias figuntur unctae pice liquida, et exaggerantur ad id, uti longitudinis octava pars fiat summa crassitudo. Supra eas circumdantur et figuntur tabulae, quae pertegant eam involutionem. Tunc eae tabulae pice saturantur et lamminis ferreis conligantur, ut ab aquae vi ne dissolvantur. Capita tigni ferrea. Dextra autem ac sinistra cocleam tigna conlocantur in capitibus utraque parte habentia transversaria confixa. In his foramina ferrea sunt inclusa inque ea inducuntur styli, et ita cocleae hominibus calcantibus faciunt versationes.*

[3] Following the same tracks, fix further strips over the first, coating them with liquid pitch and building them up until the total thickness is one-eighth of the length. Enclose the winding construction with boards, saturate these with pitch and bind them with iron bands so that the pressure of the water cannot force them apart. Fit iron ends to the central timber. Place supporting timbers on either side of the screw, with crosspieces fixed at both ends. Iron bearings set into these receive the pivots, allowing the screw to rotate when operated by men treading on it.

[4] *Erectio autem eius ad inclinationem sic erit conlocanda, uti, quemadmodum Pythagoricum trigonum orthogonium describitur, sic id habeat responsum, id est uti dividatur longitudo in partes V, earum trium extollatur caput cocleae; ita erit ab perpendiculo ad imas naris spatium earum partium IIII. Qua ratione autem oporteat id esse, in extremo libro eius forma descripta est in ipso tempore.*

[4] Set the screw at the inclination of a Pythagorean right triangle: divide its length into five parts and raise its upper end by three of them. The horizontal distance from the foot of the perpendicular to the lower inlet will then be four parts. The arrangement is illustrated by a figure at the end of this book.

Quae de materia fiunt organa ad hauriendam aquam, quibus rationibus perficiantur quibusque rebus motus recipientia praestent versationibus infinitas utilitates ut essent notiora, quam apertissime potui, perscripta sunt in illo tempore.

I have described as clearly as I can how wooden devices for drawing water are made, how their construction is completed, and how the motion they receive enables their rotations to provide many useful services, so that these matters may be better understood.

Technical paraphrase. The preceding devices convert human or water-driven movement into the rotation needed to lift water. Their materials, assembly and means of transmitting motion belong to the same constructional explanation.

Critical and geometrical note — X.6. The coclea is a helical water-lifting machine. The timber's dimensions, eightfold divisions, helical construction and final inclination derived from the 3–4–5 triangle are interdependent instructions. A reconstruction should identify its assumptions and the status of the missing or altered figure instead of claiming that successful operation independently proves a particular Latin reading.

Chapter 7

[1] *Insequitur nunc de Ctesibica machina, quae in altitudinem aquam educit, monstrare. Ea fit ex aere. Cuius in radicibus modioli fiunt gemelli paulum distantes, habentes fistulas furcillae figura similiter cohaerentes, in medium catinum concurrentes. In quo catino fiunt asses in superioribus naribus fistularum coagmentatione subtili conlocati, qui praeobturantes foramina narium non patiuntur ⟨redire⟩ quod spiritu in catinum est expressum.*

[1] There follows the machine of Ctesibius, which raises water to a height. It is made of bronze. At its base are two cylinders (*modioli*) set a little apart, with pipes joined in the shape of a fork and meeting at a central vessel. In this vessel are fitted valves (*asses*), carefully placed over the upper mouths of the pipes, which by stopping those openings keep back what has been driven into the vessel under pressure.[166]

Editorial note. — The machine here described (X.7) is the force pump of Ctesibius of Alexandria (fl. third century BC): a twin-cylinder bronze pump fitted with valves, in which pistons driven alternately force water under pressure through a central chamber. It is the earliest detailed account of a reciprocating force pump, and the principle it embodies — valved cylinders raising a fluid by pressure — underlies hydraulic and fire-fighting pumps to the present day.

[2] Supra catinum paenula ut infundibulum inversum est attemperata et per fibulam cum catino cuneo traiecto continetur, ne vis inflationis aquae eam cogat elevari. Insuper fistula, quae tuba dicitur, coagmentata in altitudine fit erecta. Modioli autem habent infra nares inferiores fistularum asses interpositos supra foramina eorum, quae sunt in fundis.

[2] A cover shaped like an inverted funnel is fitted above the central vessel and secured to it by a fastening with a wedge driven through, so that the pressure of the water cannot lift it. A pipe called the tuba is joined above it and rises vertically. The cylinders also have valves above the holes in their bottoms, beneath the lower mouths of the pipes.

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166 The pump of Ctesibius described by Vitruvius (10.7) uses two bronze cylinders, pipes, valves and pistons operated by rods and levers to force water into a central vessel and an ascending pipe. This explanation follows the Vitruvian description; comparisons with later pumps belong to the history of technology rather than to the ancient text.

[3] *Ita de supernis in modiolis emboli masculi torno politi et oleo subacti conclusique regulis et vectibus cum molientur. Qui erit aer ibi cum aqua, assibus obturantibus foramina cogent. et trudent inflando pressionibus per fistularum nares aquam in catinum, e quo recipiens paenula spiritu exprimit per fistulam in altitudinem, et ita ex inferiore loco castello conlocato ad saliendum aqua subministratur.*

[3] Pistons, accurately turned on a lathe and lubricated with oil, are inserted into the cylinders from above and operated by rods and levers. As the valves close the openings, the pistons compress the air and water within the cylinders and drive the water under pressure through the mouths of the pipes into the central vessel. The cover receives it and forces it upward through the delivery pipe. In this way, water can be supplied from a reservoir at a lower level to form a fountain jet.

4. Nec tamen haec sola ratio Ctesibii fertur exquisita, sed etiam plures et variis generibus ab eo liquore pressionibus coactae spiritus efferre ab natura mutuatos effectus ostenduntur, uti merularum [quae motu] voces atque acrobatae bibentiaque et eadem moventia ⟨se⟩ sigilla ceteraque, quae delectationibus oculorum et aurium usu sensus eblandiantur.

[4] This is not the only device attributed to Ctesibius. Many other inventions of different kinds are said to use air compressed by water to reproduce effects found in nature: the songs of blackbirds, acrobatic figures, little figures that drink and move, and other devices that delight the senses through the pleasures of sight and hearing.

[5] *E quibus quae maxime utilia et necessaria iudicavi selegi, et in priore volumine de horologiis, in hoc de expressionibus aquae dicendum putavi. Reliqua quae non sunt ad necessitatem sed ad deliciarum voluptatem, qui cupidiores erunt eius subtilitatis, ex ipsius Ctesibii commentariis poterunt invenire.*

[5] From these inventions I have selected those I judged most useful and necessary. In the preceding book I discussed clocks; in this one, devices for forcing water upward. Readers interested in the ingenious details of inventions made for amusement rather than necessity may consult Ctesibius's own writings.

Critical note — X.7. The supplement ⟨redire⟩ makes the valves' prevention of reverse flow explicit. Modioli, fistulae, catinum, asses, nares, emboli, paenula

and tuba remain controlled mechanical terms. The bracketed quae motu and supplied ⟨se⟩ in moventia ⟨se⟩ sigilla retain their critical status. The alternating action of two cylinders, valves and pistons is explained without equating every component with a modern pump.

Chapter 8

[1] *De hydraulis autem, quas habeant ratiocinationes, quam brevissime proximeque attingere potero et scriptura consequi, non praetermittam. De materia compacta basi, ara in ea ex aere fabricata conlocatur. Supra basim eriguntur regulae dextra ac sinistra scalari forma compactae, quibus includuntur aerei modioli, fundulis ambulatilibus ex torno subtiliter subactis habentibus fixos in medio ferreos ancones et verticulis cum vectibus coniunctos, pellibusque lanatis involutis. Item in summa planitia foramina circiter digitorum ternûm. Quibus foraminibus proxime in verticulis conlocati aerei delphini pendentia habent catenis cymbala ex ore infra foramina modiolorum calata.*

[1] I shall also explain the principles of water organs as briefly and precisely as a written account allows. An altar-shaped bronze casing is set on a base of joined timber. On either side, ladder-like upright frames hold bronze pump cylinders. Their movable bottoms are accurately turned, wrapped in fleeced skins and fitted at the center with iron elbow pieces jointed to operating levers. In the top surfaces are openings about three digits across. Beside them, bronze dolphins mounted on pivots carry chains in their mouths; cymbal-shaped valves hang from the chains beneath the cylinder openings.

[2] *Intra aram, quo loci aqua sustinetur, inest pnigeus uti infundibulum inversum, quem subter taxilli alti circiter digitorum ternûm suppositi librant spatium imum ima inter labra pnigeos et arae fundum. supra autem cerviculam eius coagmentata arcula sustinet caput machinae, qui graece κανὼν μουσικός appellatur. In cuius longitudine canales, si tetrachordos est, fiunt quattuor, si hexachordos, sex, si octo chordos, octo.*

[2] Inside the altar-shaped casing, where the water is held, is a pnigeus shaped like an inverted funnel. Blocks about three digits high support it from below, leaving that clearance between its lower rim and the floor of the casing. Above its neck, a fitted windchest supports the head of the instrument, called the canon musicus (κανὼν μουσικός) in Greek. Along its length there are four channels if the instrument is tetrachord, six if hexachord, and eight if octochord.

[3] *Singulis autem canalibus singula epitonia sunt inclusa, manubriis ferreis conligata. Quae manubria, cum torquentur, ex arca patefaciunt nares in canales. Ex canalibus autem canon habet ordinata in transverso foramina respondentia*

naribus, quae sunt in tabula summa, quae tabula graece πίναξ dicitur. Inter tabulam et canona regulae sunt interpositae ad eundem modum foratae et oleo subactae, ut faciliter inpellantur et rursus introrsus reducantur, quae obturant ea foramina plinthidesque appellantur. Quarum itus et reditus alias obturat alias aperit terebrationes.

[3] A separate stopcock, or epitonion, is fitted into each channel and connected to an iron handle. Turning the handles opens passages from the windchest into the channels. The canon has transverse rows of holes corresponding to the openings in the upper board, called the pinax (πίναξ). Between the board and the canon lie sliders, similarly pierced and lubricated with oil so that they can move easily inward and outward. These sliders, called plinthides, close or open the holes as they advance and return.

4. Haec regulae habent ferrea choragia fixa et iuncta cum pinnis, quarum pinnarum tactus motiones efficit regularum continenter. Supra tabulam foramina ⟨que, per⟩ quae ex canalibus habent egressum spiritus, sunt anuli adglutinati, quibus lingulae omnium includuntur organorum. E modiolis autem fistulae sunt continentes coniunctae pnigeos cervicibus pertinentesque ad nares, quae sunt in arcula. In quibus asses sunt ex torno subacti et ibi conlocati, ⟨ubi fistulae modiolis sunt coniunctae,⟩ qui, cum recepit arcula animam, spiritum non patientur obturantes foramina rursus redire.

[4] Iron linkages fixed to the sliders connect them to the keys; touching the keys moves the sliders in succession. Rings are attached above the openings in the upper board through which air emerges from the channels, and receive the tongues of the organ pipes. Connecting pipes run from the cylinders to the neck of the pnigeus and the openings in the windchest. Turned valves are fitted ⟨where the pipes join the cylinders⟩; once the windchest has received air, these valves close the openings and prevent it from flowing back.

[5] *Ita cum vectes extolluntur, ancones deducunt fundos modiolorum ad imum delphinique, qui sunt in verticulis inclusi, calantes in eos cymbala, aere implent spatia modiolorum, atque ancones extollentes fundos intra modiolos vehementi pulsus crebritate et obturantes foramina cymbalis superiora, aera, qui est ibi inclusus, pressionibus coactum in fistulas cogunt, per quas in pnigea concurrit et*

per eius cervices in arcam. Motione vero vectium vehementiore spiritus frequens compressus epitoniorum aperturis influit et replet animae canales.

[5] When the levers are raised, the elbow pieces draw the cylinder bottoms downward. The pivoted dolphins lower their cymbal-shaped valves, allowing the cylinders to fill with air. The elbow pieces then drive the bottoms upward with repeated strong strokes. As the valves close the upper openings, the air trapped in the cylinders is compressed and forced through the pipes into the pnigeus and through its neck into the windchest. More vigorous movement of the levers increases the compressed air supply, which passes through the open stopcocks and fills the channels.

[6] Itaque cum pinnae manibus tactae propellunt et reducunt continenter regulas alternis obturando foramina alternis aperiundo, e musicis artibus multiplicibus modulorum varietatibus sonantes excitant voces.

[6] And so, when the keys (*pinnae*), pressed by the player's hands, push the sliders forward and draw them back, by turns closing and opening the holes, they draw from the pipes a rich variety of musical sound, resounding in many melodies.

Editorial note. — The instrument of X.8 is the water organ (Greek *hydraulis*), invented by Ctesibius of Alexandria: a set of graduated bronze pipes sounded by air whose pressure is regulated by a water-filled chamber, and played from a row of balanced keys. It is the earliest keyboard instrument and the direct ancestor of the pipe organ.

Technical paraphrase. Pressing a key moves a pierced slider, aligning or closing an air passage beneath the musical pipes. The keys control the sliders; they do not push and pull the pipes themselves.

Quantum potui niti, ut obscura res per scripturam dilucide pronuntiaretur, contendi, sed haec non est facilis ratio neque omnibus expedita ad intellegendum praeter eos, qui in his generibus habent exercitationem. Quodsi qui parum intellexerit ex scriptis, cum ipsam rem cognoscet, profecto inveniet curiose et subtiliter omnia ordinata.

I have done all I can to explain a difficult subject clearly in writing. Its principles are not easy for everyone to understand, except those experienced in such devices. Anyone who has not fully understood the written account will, on

examining the instrument itself, find that every part has been arranged with care and precision.

Explanatory paraphrase. Vitruvius acknowledges the limits of a verbal description: practical examination of the instrument is needed to understand how its carefully arranged components work together.

Critical and organological note — X.8. Intra aram, coagmentata arcula, conligata, the supplement ⟨per⟩ and ⟨ubi fistulae modiolis sunt coniunctae⟩ affect the reconstruction of the hydraulis. Pnigeus, canon musicus, pinax, epitonia and plinthides retain their technical identities. The pneumatic mechanism is distinguished from the musical pipe system. Spiritus and anima refer to air in this context; metaphysical translations would misrepresent the device.

Chapter 9

[1] *Transfertur nunc cogitatio scripturae ad rationem non inutilem sed summa sollertia a maioribus traditam, qua in via raeda sedentes vel mari navigantes scire possimus, quot milia numero itineris fecerimus. Hoc autem erit sic. Rotae, quae erunt in raeda, sint latae per medium diametrum pedum quaternûm [et sextantes], ut, cum finitum locum habeat in se rota ab eoque incipiat progrediens in solo viae facere versationem, perveniendo ad eam finitionem, a qua coeperit versari, certum modum spatii habeat peractum pedes XII s<>.*

[1] I now turn to a device of no little usefulness, bequeathed by our forebears with the greatest ingenuity, whereby a man seated in his carriage upon the road, or sailing at sea, may learn how many miles he has traveled. It is contrived thus. The wheels of the carriage are to be four feet in diameter, so that, a fixed point being marked upon one wheel where it first meets the surface of the road, when it returns to that same point in its revolution it will have measured out a definite distance of twelve feet and a half.

[2] *His ita praeparatis tunc in rotae modiolo ad partem interiorem tympanum stabiliter includatur habens extra frontem suae rotundationis extantem denticulum unum. Insuper autem ad capsum raedae loculamentum firmiter figatur habens tympanum versatile in cultro conlocatum et in axiculo conclusum, in cuius tympani fronte denticuli perficiantur aequaliter divisi numero quadringenti convenientes denticulo tympani inferioris. Praeterea superiori tympano ad latus figatur alter denticulus prominens extra dentes.*

[2] Having thus prepared these things, a drum is then firmly enclosed in the inner part of the wheel hub, having one denticle protruding beyond the front of its rounding. Moreover, a slot is firmly fixed to the carriage box, having a revolving drum placed in a knife and enclosed in a shaft, into the front of which drum are made denticles evenly divided into four hundred corresponding denticles of the lower drum. Furthermore, another denticle protruding beyond the teeth is fixed to the side of the upper drum.

[3] *Super autem, ⟨tympanum⟩ planum eadem ratione dentatum inclusum in altero loculamento conlocetur, convenientibus dentibus denticulo, qui in secundi tympani latere fuerit fixus, in eoque tympano foramina fiant, quantum diurni itineris miliariorum numero cursus raedae possit exire. Minus plusve rem nihil inpedit. Et in his foraminibus omnibus calculi rotundi conlocentur, inque eius*

tympani theca, sive id loculamentum est, fiat foramen unum habens canaliculum, qua calculi, qui in eo tympano inpositi fuerint, cum ad eum locum venerint, in raedae capsum et vas aeneum, quod erit suppositum, singuli cadere possint.

[3] Above, however, a plane, toothed in the same way, shall be placed in another recess, with the teeth fitting into a denticle, which shall be fixed on the side of the second drum, and holes shall be made in that drum, as many as the number of miles of daily journey the chariot can make. Less or more is nothing to the purpose. And in all these holes shall be placed round stones, and in the case of that drum, or that recess, shall be made a single hole having a small channel, by which the stones which have been placed in that drum, when they come to that place, may fall individually into the box of the chariot and the brass vessel which shall be suppositum.

Editorial note. — The device described in X.9 is the earliest detailed account of an odometer (*hodometer*): a train of gears driven by the carriage wheel that, after a fixed number of revolutions, releases a pebble into a bronze vessel, so that the miles traveled may be counted at the journey's end. The same principle — measuring distance by the revolutions of a wheel — survives in the modern odometer.

Furthermore, the toothed plane, enclosed in the same way, is inserted into the second pocket, aligning its teeth with the tooth fixed to the side of the second drum. Holes are then made in this drum, according to the number of kilometers traveled daily by the coach. Nothing complicates the matter further. Round stones will be placed in all these holes, and the drum's body, or rather, the box itself, will be a hole with a channel through which the stones placed in the drum will pass when they reach that point, in the carriage's body and in the copper vessel, where it is assumed each one may fall.

[4] Ita cum rota progrediens secum agat tympanum imum et denticulum eius singulis versationibus tympani superioris denticulos inpulsu cogat praeterire, efficiet, <ut,> cum CCCC imum versatum fuerit, superius tympanum semel circumagatur et denticulus, qui est ad latus eius fixus, unum denticulum tympani plani producat. Cum ergo CCCC versationibus imi tympani semel superius versabitur, progressus efficiet spatia pedum milia quinque, id est passus mille. Ex eo quot calculi deciderint sonando singula milia exisse monebunt.

Numerus vero calculorum ex imo collectus summa diurni <itineris> miliariorum numerum indicabit.

[4] Thus, when the wheel advances, it drives the lower drum with it and its tooth with each rotation of the upper drum forces the teeth to pass by, so that when the lower drum has been rotated 400 times, the upper drum is rotated once and the tooth fixed to its side produces one tooth of the flat drum. Therefore, when the lower drum has been rotated once with 400 times, the progress will be 1,500 feet, that is, 1,000 paces. From this, the number of pebbles that have fallen will indicate by ringing that each thousand has passed. The number of pebbles collected from the bottom will indicate the total number of miles of the daily journey.

***Editorial note.* — This device (X.9) is the earliest detailed description of an odometer: a train of toothed wheels geared to a carriage wheel, so contrived that at the completion of each Roman mile a small stone falls into a bronze receptacle. By counting the stones gathered at day's end the traveler reckons the distance covered. Vitruvius adapts the same mechanism, with paddle-wheels in place of road-wheels, to measure distance sailed at sea.**

Thus, as the wheel advances, the lower drum moves with it, and its teeth, with each revolution of the upper drum, force it to pass the teeth of the upper drum by impact, so that, when the lower wheel has advanced by turning 300 times, the upper drum is turned once and the tooth, which is fixed to its side, produces a flat, tympanic dent. When, therefore, 300 revolutions of the bottom of the drum are made once it is up, the advance will cover a distance of five thousand feet, that is, one thousand miles. From this, count how many counters will fall when they chime to indicate that each thousand has been completed. The number of calculations collected at the bottom will indicate the total number of daily miles traveled.

5. Navigationibus vero similiter paucis rebus commutatis eadem ratione ⟨eadem⟩ efficiuntur. Namque traicitur per latera parietum axis habens extra navem prominentia capita, in quae includuntur rotae diametro pedum quaternûm, extantes habentes circa frontes adfixas pinnas aquam tangentes. Item medius axis in media navi ⟨habet⟩ tympanum cum uno denticulo extanti extra suam

rotunditatem. Ad eum locum conlocatur loculamentum habens inclusum in se tympanum, peraequatis dentibus CCCC convenientibus denticulo tympani, quod est in axe inclusum, praeterea ad latus adfixum extantem extra rotunditatem alterum dentem unum.

[5] In the same way, with a few changes, navigation is achieved by the same method. For an axle is driven through the sides of the walls, having heads protruding beyond the ship, into which are enclosed wheels with a diameter of four and a half feet, having fins fixed around the fronts, touching the water. Likewise, the middle axle in the middle of the ship has a drum with one tooth protruding beyond its roundness. At that place is placed a pocket having a drum enclosed within it, with 400 equal teeth matching the tooth of the drum, which is enclosed in the axle, and on the other side is fixed another tooth protruding beyond its roundness.

[6] *Insuper in altero loculamento cum eo confixo inclusum tympanum planum ad eundem modum dentatum, quibus dentibus <convenit> denticulus, qui est ad latus fixus tympano, quod est in cultro conlocatum ut eos dentes, qui sunt plani tympani, singulis versationibus singulos dens inpellendo in orbem planum tympanum verset. In plano autem tympano foramina fiant, in quibus foraminibus conlocabuntur calculi rotundi, In theca eius tympani, sive loculamentum est, unum foramen excavetur habens canaliculum, qua calculus liberatus ab obstantia cum ceciderit in vas aereum, sonitu significet.*

[6] Moreover, in another cavity, fixed with it, is enclosed a flat tympanum, toothed in the same manner, with which teeth <fit> a small tooth, which is fixed to the side of the tympanum, which is placed in the knife so that those teeth, which are the flat tympanum, with each rotation, pushing each tooth into the plane of the tympanum turn it. Now in the flat tympanum are to be made holes, in which holes round stones will be placed. In the case of that tympanum, or cavity, one hole is to be dug out having a small canal, through which the stone, freed from obstacles, when it falls into the brass vessel, will produce a sound.

[7] Ita navis cum habuerit impetum aut remorum aut ventorum flatu, pinnae, quae erunt in rotis, tangentes aquam adversam vehementi retrorsus inpulsu coactae versabunt rotas; eae autem involvendo se agent axem, axis vero tympanum, cuius dens circumactus singulis versationibus singulos secundi

tympani dentes inpellendo modicas efficiet circumitiones. Ita cum CCCC ab pinnis rotae fuerint versatae, semel tympanum circumactum inpellet dente, qui est ad latus fixus, plani tympani dentem. Igitur circumitio tympani plani quotienscumque ad foramen perducet calculos, emittet per canaliculum. Ita et sonitu et numero indicabit miliaria spatia navigationis.

[7] Thus when the ship has an impulse either by the oars or by the wind, the fins which will be on the wheels, touching the opposing water, will be forced by a strong backward thrust to turn the wheels; and these, by wrapping themselves, will drive the axle, and the axle the drum, whose tooth, turned round, with each rotation, drives each tooth of the second drum, making small revolutions. Thus when the wheels have been turned 400 times by the fins, once the drum has been turned round, it will drive the tooth, which is fixed to the side, of the flat drum. Therefore, whenever the revolution of the flat drum brings the pebbles to the hole, it will send them out through the canal. Thus it will indicate by both sound and number the miles of navigation.

Quae pacatis et sine metu temporibus ad utilitatem et delectationem paranda, quemadmodum debeant fieri, peregi esse futurum.

I have explained how to construct the devices intended for use and enjoyment in peaceful times, free from danger.

The preceding account concerns useful and pleasurable devices for peaceful circumstances; the discussion now turns to engines required for defense.

Critical and metrological note — X.9. The odometer is a kinematic sequence: vehicle wheel, single tooth, four-hundred-tooth wheel, further gearing and the successive fall of calculi. The supplement ⟨tympanum⟩ remains visible, as does the bracketed et sextantes in the wheel diameter. The relation to five thousand feet is part of an idealised scheme; practical accuracy depends on effective wheel diameter and slipping. The marine version uses paddle wheels to apply the same counting principle.

Chapter 10

[1] Nunc vero quae ad praesidia periculi et necessitatem salutis sunt inventa, id est scorpionum et ballistarum rationes, quibus symmetriis comparari possint, exponam.

[1] I shall now set forth what has been devised for defense in time of peril and for the preservation of safety — namely, the proportions of scorpions and ballistae, and the symmetries by which they may be constructed.

Omnes proportiones eorum organorum ratiocinandorum ⟨sumuntur⟩ ex proposita sagittae longitudine, quam id organum mittere debet, eiusque nonae partis fit foraminis in capitulis magnitudo, per quae tenduntur nervi torti, qui bracchia continere debent.

All the proportions of these engines are calculated from the intended length of the arrow. One-ninth of that length determines the diameter of the opening in each head, through which the twisted sinew bundles that hold the arms are stretched.

The arrow's proposed length supplies the initial module: its ninth part gives the torsion opening in the capitulum, and the remaining dimensions are derived from that opening.

Technical note — X.10–12. The catapulta or scorpio of X.10 is dimensioned from the projectile's length; the ballista of X.11 from the stone's weight. Both use bundles of twisted sinew or hair to store energy. The adjustment in X.12 is acoustic: the two bundles are tightened until they produce corresponding sounds. Fractional signs whose values remain uncertain are marked [...] in the translation; textual corruption is marked †...† and a lacuna by * * *. These different signs must not be treated as interchangeable, nor should missing dimensions be reconstructed solely by proportional inference.

Comparative note — Bk. 10.10–10.12 (catapultae and ballistae). Callebat and Fleury's Budé (1986) reconstructs these engines with diagrams and confronts the text with archaeology (the finds at Ampurias, Cremona, Hatra). Granger (Loeb) and Rowland–Howe (Cambridge, 1999) discuss the terminology (scorpio, catapulta, ballista, euthytonon/palintonon) and its correspondence with Philon of Byzantium and Hero; Livy (26.47) and Pliny

corroborate the types. The iconography of Trajan's Column illustrates the cart-mounted ballistae in the field. This edition keeps the transmitted text and translates in its own voice, with no variant affecting the sense.

2. Ipsûm tamen eorum foraminum capituli ⟨e magnitudine omnis⟩ deformatur altitudo et latitudo. Tabulae, quae sunt in summo et in imo capituli, peritretoe quae vocantur, fiant crassitudine unius foraminis, latitudine unius et eius dodrantis, in extremis foraminis unius et eius ⟨S⟩. Parastaticae dextra ac sinistra praeter cardines altae foraminum IIII, crassae foraminum† quinum; cardines foraminis dimidia. ⟨A⟩ parastatica ad foramen spatium foraminis, a foramine ad medianam parastaticam item foraminis. Latitudo parastados mediae unius foraminis et eius ⟨T⟩K, crassitudo foraminis unius.

2. The size of these openings determines the height and width of the whole head. The upper and lower boards, called peritretoe, should be one opening thick, one and three-quarter openings wide, and one and a half wide at the ends. The side uprights, excluding their tenons, should be four openings high and [...] thick; the tenons should measure half an opening. Leave one opening between the side upright and the torsion opening, and another between the opening and the central upright. The central upright should be one opening and [...] wide, and one opening thick.

3. Intervallum, ubi sagitta conlocatur in media parastade, foraminis partis quartae. Anguli quattuor, qui sunt circa, in lateribus et frontibus lamnis ferreis aut stylis aereis et clavis configantur. Canaliculi, qui graece σῦριγξ dicitur, longitudo foraminum XVIIII. Regularum, quas nonnulli bucculas appellant, quae dextra ac sinistra canalem figuntur, ⟨longitudo⟩ foraminum XVIIII, altitudo foraminis unius et crassitudo. Et adfiguntur regulae duae, in quas inditur sucula, habentes longitudinem foraminum trium, latitudinem dimidium foraminis. Crassitudo bucculae, quae adfigitur (vocitatur scamillum seu, quemadmodum nonnulli, loculamentum) securiclatis cardinibus fixa, foraminis I, altitudo foraminis S¯. Suculae longitudo foraminum::, crassitudo suculae foraminis VIIII.

3. The space for the arrow in the central upright should be one-quarter of an opening. Secure the four surrounding corners, on the sides and faces, with iron plates or bronze bolts and nails. The channel, called σῦριγξ in Greek, should be nineteen openings long. The rails, sometimes called bucculae, fixed on either side of it should likewise be nineteen openings long, and one opening high and thick. Two further rails, into which the windlass is fitted, should be three openings long and half an opening wide. The attached buccula, also called a scamillum or loculamentum and secured by dovetail tenons, should be one opening thick and [...] high. The windlass should be [...] openings long; its thickness is given as nine [...] of an opening.

4. Epitoxidos longitudo foraminis S¯, crassitudo:¯. Item chelonii. Cheles, sive manucla dicitur, longitudo foraminum trium, latitudo et crassitudo S÷. Canalis fundi longitudo foraminum XVI, crassitudo foraminis, altitudo S÷. Columellae basis in solo foraminum VIII, latitudo in plinthide, in qua statuitur columella, foraminis, crassitudo FZ, columellae longitudo ad cardinem foraminum XII, latitudo foraminis S÷, crassitudo. Eius capreoli tres, quorum longitudo foraminum VIIII, latitudo dimidium foraminis, crassitudo Z. Cardines longitudinis foraminis; columellae capitis longitudo ISK; antefixi latitudo foraminis, crassitudo I.

4. The epitoxis should be [...] of an opening long and [...] thick; the same applies to the chelonium. The chele, or manucla, should be three openings long, with a width and thickness of [...]. The channel floor should be sixteen openings long, one opening thick and [...] high. The upright's ground base should be eight openings long, one opening wide at the plinthis on which the upright rests, and [...] thick. The upright should measure twelve openings up to its tenon, with a width and thickness of [...]. Its three braces should be nine openings long, half an opening wide and [...] thick. The tenons should be one opening long; the upright's head [...] long; the antefixum one opening wide and [...] thick.

5. Posterior minor columna, quae graece dicitur ἀντίβασις, foraminum VIII, latitudo foraminis SI, crassitudinis FZ. Subiectio foraminum XII, latitudinis et crassitudinis eiusdem, cuius minor columna illa.

Supra minorem columnam chelonium, sive pulvinus dicitur, foraminum IIS, altitudinis IIS, latitudinis SI⁻ cherolabae sucularum foraminum II S⁻, crassitudo foraminis, latitudo IS. Transversariis cum cardinibus longitudo foraminum, latitudo IS et crassitudo. Bracchii longitudo [IS] foraminum VII, crassitudo ab radice foraminis FZ, in summo foraminis ⟨CC⟩Z; curvaturae foraminis VIII.

5. The smaller rear upright, called ἀντίβασις in Greek, should be eight openings long, [...] wide and [...] thick. The support should be twelve openings long, with the same width and thickness as that upright. Above it, the chelonium or pulvinus should measure two and a half openings in length and height, and [...] in width. The windlass handles should be two openings and [...] long, one opening thick and one and a half wide. The crosspieces, including their tenons, should be [...] openings long, one and a half wide and equally thick. Each arm should be seven openings long, [...] thick at the root and [...] at the tip, with a curvature of eight openings.

6. Haec his proportionibus aut adiectionibus aut detractionibus comparantur. Nam si capitula altiora, quam erit latitudo, facta fuerint, quae anatona dicuntur, de bracchiis demetur, ut, quo mollior est tonus propter altitudinem capituli, bracchii brevitas faciat plagam vehementiorem. ⟨Si⟩ minus altum capitulum fuerit, quod catatonum dicitur, propter vehementiam bracchia paulo longiora constituentur, uti facile ducantur. Namque quemadmodum vectis, cum est longitudine pedum quinque, quod onus IIII hominibus extollit, id, qui est X, duobus elevat, eodem modo bracchia, quo longiora sunt, mollius, quo breviora, durius ducuntur.

6. These dimensions are used with the appropriate additions or reductions. When the heads are higher than they are wide, a form called anatonon, the arms should be shortened: the greater height makes the tension gentler, and shorter arms produce a more forceful discharge. When the head is lower, a form called catatonon, make the arms somewhat longer to ease the stronger tension. A five-foot lever requires four men to lift a load that a ten-foot lever raises with two. In the same way, longer arms are easier to draw back, and shorter ones harder.

Chapter 11

1. Catapultarum rationes, e quibus membris ex portionibus componantur, dixi. Ballistarum autem rationes variae sunt et differentes unius effectus causa comparatae. Aliae enim vectibus suculis, nonnullae polyspastis, aliae ergatis, quaedam etiam tympanorum torquentur rationibus. Sed tamen nulla ballista perficitur nisi ad propositam magnitudinem ponderis saxi, quod id organum mittere debet. Igitur de ratione earum non est omnibus expeditum, nisi qui geometricis rationibus numeros et multiplicationes habent notas.

1. I have explained the construction of catapults and the dimensions of their members. Ballistae employ several different systems, although all serve one purpose. Some are drawn back with levers and windlasses, others with pulley systems or capstans, and others with drums. Yet every ballista is designed according to the intended weight of the stone it must discharge. Its calculation is therefore readily understood only by those acquainted with numbers and geometrical multiplication.

2. Nam quae fiunt in capitibus foramina, per quorum spatia contenduntur capillo maxime muliebri vel nervo funes, magnitudine ponderis lapidis, quem debet ea ballista mittere, ex ratione gravitatis proportiones sumuntur, quemadmodum catapultis de longitudinibus sagittarum. Itaque ut etiam qui geometricen non noverunt, habeant expeditum, ne in periculo bellico cogitationibus detineantur, quae ipse faciundo certa cognovi quaeque ex parte accepi a praeceptoribus, finita exponam, et quibus ⟨ponde⟩ribus Graecorum pensiones ad modulos habeant rationem, ad eam ut etiam nostris ponderibus respondeant, tradam explicata.

2. The openings in the heads, through which bundles of hair—especially women's hair—or sinew are stretched, are proportioned to the weight of the stone the ballista is to discharge, just as catapult dimensions are derived from arrow length. To make the rules accessible to those unfamiliar with geometry, and spare them calculations amid the dangers of war, I shall set out what I have established through practice and what I have received from my teachers. I shall also explain how the Greek weight standards correspond to our own.

Editorial note. — Greek and Roman artillery of this kind was powered by torsion: skeins of twisted cord — made of sinew or of women's hair, prized for its elasticity — stored energy as the arms were drawn back. The whole machine was calibrated from a single module, the diameter of the bore (*foramen*) that held the spring, which Vitruvius scales here to the weight of the projectile.

3. Nam quae ballista duo pondo saxum mittere debet, foramen erit in eius capitulo digitorum V; si pondo IIII, digitorum sex et * * * digitorum VII; decem pondo digitorum VIII; viginti pondo digitorum X; XL pondo digitorum XII SK; LX pondo digitorum XIII et digiti octava parte; LXXX pondo digitorum XV; CXX pondo I pedis et sesquidigiti; C et LX pedis I9; C et LXXX pedis et digitorum V; CC pondo pedis et digitorum VI; CC et X ⟨L pondo⟩ pedis I et digitorum VII; CCCLX * * * pedis I S.

3. A ballista intended to throw a two-pound stone should have a five-finger opening in its head; for four pounds, six fingers; * * *, seven fingers; for ten pounds, eight fingers; for twenty, ten; for forty, twelve and [...]; for sixty, thirteen fingers and one-eighth; for eighty, fifteen fingers; for one hundred and twenty, one foot and one and a half fingers; for one hundred and sixty, one foot and [...]; for one hundred and eighty, one foot and five fingers; for two hundred, one foot and six fingers; for two hundred and forty, one foot and seven fingers; and for three hundred and sixty * * *, one and a half feet.

Textual note — X.11.3. Krohn prints CC et X⟨L pondo⟩: 240 pounds, not 250. The original Spanish translation gives 250 at this point, while its accompanying textual note gives 240; the English follows the adopted Latin numeral. The adjacent fractional values retain their stated uncertainties.

4. Cum ergo foraminis magnitudo fuerit instituta, describatur scutula, quae graece περίτρητος appellatur, cuius longitudo foraminum †vel, latitudo duo et sextae partis. Dividatur medium lineae descriptae et, cum divisum erit, contrahantur extremae partes eius formae, ut obliquam deformationem habeat longitudinis sexta parte, latitudinis, ubi est versura, quarta parte. In qua parte autem est curvatura, in quibus procurrunt cacumina angulorum, eo foramina convertantur, et contractura latitudinis redeat introrsus sexta parte, foramen autem oblongius sit tanto, quantam epizygis habet

crassitudinem. Cum deformatum fuerit, circum levigatur, extremam ut habeat curvaturam molliter circumactam.

4. Once the opening's size has been established, draw the scutula, called περίτρητος in Greek. Its length is †...† openings and its width two and one-sixth. Bisect the drawn line, then contract the extremities of the figure so that it assumes an oblique form, by one-sixth of its length and one-quarter of its width at the angle. Where the curve lies, towards which the points of the angles project, turn the openings accordingly. Let the contraction of the width recede inward by one-sixth, and make the opening longer by the thickness of the epizygis. Smooth the outline so that its end has a gently rounded curve.

5. Crassitudo eius foraminis constituatur. Modioli foraminum duo, latitudo IS9, crassitudo praeterquam quod in foramine inditur foraminis, ad extremum autem latitudo foraminis. Parastatarum longitudo foraminis VSF; curvatura foraminis pars dimidia; crassitudo foraminis et partis LX. Adicitur autem ad mediam latitudinem, quantum est prope foramen factum in descriptione, latitudine et crassitudine foraminis V, altitudo parte IIII.

5. Set its thickness at [...] of an opening. The cylinders should be two openings long and [...] wide; excluding the portion inserted into the opening, their thickness should be [...] of an opening, and their width at the end [...]. The uprights should be [...] long; their curvature half an opening; their thickness [...] and one-sixtieth of an opening. Add to the central width the amount established beside the opening in the drawing: in width and thickness, five [...] of an opening, and in height one-quarter.

6. Regulae, quae est in mensa, longitudo foraminum VIII; latitudo et crassitudo dimidium foraminis. Cardines, crassitudo foraminis. Curvatura regulae. Exterioris regulae latitudo et crassitudo tantundem; longitudo, quam dederit ipsa versura deformationis et parastaticae latitudo ad suam curvaturam K. Superiores autem regulae aequales erunt inferioribus K. Mensae transversarii foraminisk.

6. The rail on the table should be eight openings long and half an opening wide and thick. The tenons should be [...] of an opening thick.

The rail's curvature is [...]. The outer rail has the same width and thickness; its length depends on the turn of the drawing and the upright's width up to its curvature, [...]. The upper rails should equal the lower ones, [...]. The table's crosspieces should measure [...] of an opening.

7. Climacidos scapi longitudo foraminum XIII, crassitudo IK, intervallûm mediûm latitudo foraminis et parte quarta, crassitudo pars VIII K. Climacidos superioris pars quae est proxima bracchiis, quae coniuncta est mensae, tota longitudine dividatur in partes V. Ex his dentur duae partes ei membro, quod Graeci χῆλην vocant, crassitudo 9, longitudo foraminum III et semis K; extantia cheles foraminis S; †plentigomatos foraminis et sicilicus. Quod autem est ad axona, quod appellatur frons transversarius, foraminum trium.

7. The ladder-frame's longitudinal member should be thirteen openings long and [...] thick; the central interval should be one and a quarter openings wide, and the thickness one-eighth and [...]. Divide the whole length of the upper ladder-frame adjoining the arms and the table into five parts. Assign two of these to the member the Greeks call χηλή. Its thickness is [...]; its length three and a half openings and [...]; the projection of the chele half an opening; and †the plentigoma† [...] of an opening and one sicilicus. The transverse front beside the axle should measure three openings.

8. Interiorum regularum latitudo foraminis, crassitudo chelonii replum, quod est operimentum, securiculae includitur K. Scaporum climacidos latitudo, crassitudo foraminis XII K. Crassitudo quadrati, quod est ad climacida, foraminis FC, in extremis K, rotundi autem axis diametros aequaliter erit cheles, ad claviculas autem minus parte sexta decuma K.

8. The inner rails should be one opening wide and [...] thick. The replum, or cover, of the chelonium is fitted by a dovetail joint, [...]. The ladder-frame's longitudinal members have a width and thickness of [...] of an opening, [...]. The square member beside the ladder-frame should be [...] thick, and [...] at its ends. The diameter of the round axle should equal that of the chele, but be one-sixteenth smaller beside the pins, [...].

9. Anteridon longitudo foraminum †eius, latitudo in imo foraminis, in summo crassitudo. Basis, quae appellatur ἐσχάρα, longitudo foraminum::::, antibasis foraminum IIII, utriusque crassitudo et latitudo foraminis. Compingitur autem dimidia altitudinis K. Columna, latitudo et crassitudo IS. Altitudo autem non habet foraminis proportionem, sed erit quod opus erit ad usum. Bracchii longitudo foraminum VI, crassitudo in radice foraminis, in extremis F.

9. The anterides should be †...† openings long, one opening wide at the bottom and [...] thick at the top. The base, called ἐσχάρα, should be [...] openings long; the antibasis four openings. Each should be one opening wide and thick. The assembly is joined halfway up, [...]. The upright should be one and a half openings wide and thick. Its height is determined by practical need rather than by a fixed proportion to the opening. The arm should be six openings long, one opening thick at its root and [...] at its ends.

De ballistis et catapultis symmetrias, quas maxime expeditas putavi, exposui. Quemadmodum autem contentionibus eae temperentur e nervo capilloque tortis rudentibus, quantum conprehendere scriptis potuero, non praetermittam.

I have set out the proportions of ballistae and catapults that I considered most serviceable. I shall also explain, as fully as writing allows, how their tension is adjusted using twisted bundles of sinew and hair.

Chapter 12

[1] Sumuntur tigna amplissima longitudine; supra figuntur chelonia, in quibus includuntur suculae. Per media autem spatia tignorum insecantur ⟨et⟩ exciduntur formae, in quibus excisionibus includuntur capitula catapultarum, cuneisque distinentur, ne in contentionibus moveantur. Tum vero modioli aerei in ea capitula includuntur et in eos cuneoli ferrei, quas ἐπιζυγίδας Graeci vocant, conlocantur.

1. Take timbers of the greatest possible length and fix chelonia above them to receive the windlasses. Cut and hollow out recesses in the middle of the timbers, fit the catapult heads into them and secure them with wedges so that tension cannot shift them. Insert bronze cylinders into the heads and place in them the iron wedges that the Greeks call ἐπιζυγίδες.

[2] Deinde ansae rudentum induntur per foramina capitulorum, in alteram partem traiciuntur, deinde in suculas coiciuntur ⟨et⟩ involvuntur, uti vectibus per eas ext<enti> rudentes, cum manibus sunt tacti, aequalem utrique sonitus habeant responsum. Tunc autem cuneis ad foramina concluduntur, ut non possint se remittere. Ita traiecti in alteram partem eadem ratione vectibus per suculas extenduntur, donec aequaliter sonent. Ita cuneorum conclusionibus ad sonitum musicis auditionibus catapultae temperantur.

2. Pass the loops of the bundles through the openings in the heads to the opposite side, lead them to the windlasses and wind them round. Tighten them with levers until, when struck by hand, they produce corresponding sounds on the two sides. Secure them in the openings with wedges so that they cannot loosen. Draw them through to the other side and tighten them in the same way with the windlasses and levers until they sound alike. Thus, with their wedges locked, catapults are adjusted by sound and musical hearing.

De his rebus quae potui dixi. Restat mihi de oppugnatoriis rebus, quemadmodum machinationibus et duces victores et civitates defensae esse possint.

I have said what I could concerning these matters. It remains for me to treat of the arts of assault, whereby commanders may prevail and cities be defended by means of engines.

I have said what I could about these matters. It remains for me to deal with questions of assault—how, by various means, one may defend against both attackers and states.

Chapter 13

[1] Primum ad oppugnationes aries sic inventus memoratur esse. Carthaginienses ad Gadis oppugnandas castra posuerunt. Cum autem castellum ante cepissent, id demoliri sunt conati. Posteaquam non habuerunt ad demolitionem ferramenta, sumpserunt tignum idque manibus sustinentes capiteque eius summum murum continenter pulsantes summos lapidum ordines deiciebant, et ita gradatim ex ordine totam communitionem dissipaverunt.

1. The first battering ram is said to have been devised as follows. The Carthaginians encamped to besiege Gades. After taking a fort, they attempted to demolish it. Lacking demolition tools, they took a timber, held it in their hands and repeatedly struck the top of the wall with its end. They brought down the upper courses and gradually dismantled the entire fortification.

[2] Postea quidam faber Tyrius nomine Pephrasmenos hac ratione et inventione inductus malo statuto ex eo alterum transversum uti trutinam suspendit et reducendo et inpellendo vementibus plagis deiecit Gaditanorum murum. Geras autem Chalcedonius de materia primum basim subiectis rotis fecit supraque compegit arrectariis et iugis varas et in his suspendit arietem coriisque bubulis texit, uti tutiores essent, qui in ea machinatione ad pulsandum murum essent conlocati. is autem, quod tardos conatus habuerat, testudinem arietariam appellare coepit.

2. A Tyrian craftsman named Pephrasmenos subsequently developed this discovery. He erected a mast and suspended a transverse timber from it like a balance beam. By drawing it back and driving it forward with powerful blows, he demolished the wall of Gades. Geras of Chalcedon was the first to construct a timber base on wheels, assemble a frame of uprights and crosspieces above it, suspend the ram within and cover it with oxhides to protect the men operating it against the wall. Because the engine moved slowly, he began to call it a ram-bearing tortoise.

[3] His tunc primis gradibus positis ad id genus machinationis, postea cum Philippus, Amyntae filius, Byzantios oppugnaret, Polyidos Thettalos pluribus generibus et facilioribus explicavit, a quo receperunt doctrinam Diades et Charias, qui cum Alexandro militaverunt.

[3] These first steps having been taken at that time for that kind of scheme, later, when Philip, the son of Amyntas, was attacking the Byzantines, Polydius Thettalus explained it in more and easier ways, from whom Diades and Charias, who fought with Alexander, received their instruction.

Itaque Diades scriptis suis ostendit se invenisse turres ambulatorias, quas etiam dissolutas in exercitu circumferre solebat, praeterea terebram et ascendentem machinam, qua ad murum plano pede transitus esse posset, etiam corvum demolitorem, quem nonnulli gruem appellant.

Diades records that he devised mobile towers which could be taken apart and transported with the army, together with the drill, an ascent device by which men could cross level with the wall, and the demolition crow, sometimes called the crane.

For this reason Diades shows in his writings that he had devised mobile towers, which he used to carry in the army even when dismantled, besides a borer and a scaling machine, by which one could make a way up to the wall on the level, and also a demolishing 'raven,' which some call a crane.

[4] Non minus utebatur ariete subrotato, cuius rationes scriptas reliquit. Turrem autem minimam ait oportere fieri ne minus altam cubitorum LX, latitudinem XVII, contracturam autem summam imae partis quintam, arrectaria turris in imo dodrantalia in summo semipedalia. Fieri autem ait oportere eam turrem tabulatorum decem, singulis partibus in ea fenestratis.

[4] He also used a ram that was rotated, the reasons for which he left written. He said that the smallest tower should be made no less than 60 cubits high, 17 cubits wide, and the height of the lowest part should be one-fifth, with the arrectaria in the tower at the bottom and half-foot arches at the top. He said that the tower should be made of ten stories, with windows in each part of it.

[5] Maiorem vero turrem altam cubitorum CXX, latam cubitorum XXIII <⟨S⟩ >, contracturam item quinta parte, arrectaria pedalia in imo, in summo sedigitalia. Hanc magnitudinem turris faciebat tabulatorum XX, cum haberent singula tabulata circumitionem cubitorum ternûm. Tegebat autem coriis crudis, ut ab omni plaga essent tutae.

[5] But the larger tower was 120 cubits high, 23 and a half cubits wide, and was also contracted by a fifth, with straight steps at the bottom and sedigitated at the

top. This size of the tower made it 20 stories, since each story had a circumference of 30 cubits. He covered it with rawhides, so that it would be protected from all harm.

[6] Testudinis arietariae comparatio eadem ratione perficiebatur. Habuerat autem intervallum cubitorum XXX, altitudinem praeter fastigium XIII S, fastigii autem altitudo ab strato ad summum cubita XVI. Exibat autem in altum et supra medium tectum fastigium non minus cubita duo, et supra extollebatur turricula III tabulatorum inque tabulato summo statuebantur scorpiones et catapultae, inferioribus congerebatur aquae magna multitudo ad extinguendum, si qua vis ignis inmitteretur. constituebatur autem in ea arietaria machina, quae graece dicitur κριοδόκις, in qua conlocabatur torus perfectus in torno, in quo insuper constitutus aries rudentium ductionibus et reductionibus efficiebat magnos operis effectus. Tegebatur autem is coriis crudis quemadmodum turris.

6. The ram-bearing tortoise was constructed on the same principle. It was thirty cubits wide and thirteen and a half high, excluding the roof; the roof rose sixteen cubits from its platform to the top. Above the middle of the covering it projected upward by at least two cubits, and above that stood a small tower of three stories. Scorpions and catapults occupied the highest story, while the lower ones held ample water to extinguish any fire thrown against it. Within stood the apparatus of the ram, called κριοδόκη in Greek. A turned roller supported the ram, which was driven forward and backward by ropes to strike the masonry with great force. Like the tower, the engine was covered with raw hides.

[7] De terebra has explicuit scriptis rationes. Ipsam machinam uti testudinem in medio habentem conlocatum in orthostatis canalem, quemadmodum in catapultis aut ballistis fieri solet, longitudine cubitorum L, altitudine cubiti, in quo constituebatur transversa sucula. In capite autem dextra ac sinistra trocleae duae, per quas movebatur quod inerat in eo canali capite ferrato tignum. Sub eo autem in ipso canali inclusi tori crebriter celeriores et vehementiores efficiebant eius motus. supra autem tignum, quod inibi erat, arcus tegebantur ad canalem crebriter, uti sustinerent corium crudum, quo ea machina erat involuta.

[7] He explained these reasons for the drill in writing. The machine itself was to be a shell having a shell in the middle placed in an orthostatic channel, as is usually done in catapults or ballistae, fifty cubits long and one cubit high, in

which was placed a transverse spindle. On the right and left of the head were two pulleys, by which the iron-headed beam contained in that channel was moved. Underneath that, a bed enclosed in the channel itself made its movements more rapid and violent. Above the beam, which was in it, arches were frequently placed on the channel, so as to support the raw hide that was wrapped around that machine.

[8] De corace nihil putavi scribendum, quod animadverterest eam machinam nullam habere virtutem. de accessu, quae ἐπιβάθρα graece dicitur, et de marinis machinationibus, †quae per navium aditus habere posse scripsit, tantum pollicitum esse vehementer animadverti neque rationes eorum eum explicavisse. Quae sunt ab Diade de machinis scripta, quibus sint comparationibus, exposui. nunc quemadmodum a praeceptoribus accepi et utilia mihi videntur, exponam.

8. I decided not to give an account of the corax, having found the engine ineffective. As for the boarding device, called ἐπιβάθρα in Greek, and the naval machines, †which he claimed could provide access aboard ships, I found that he had promised much without explaining their operating principles. I have described the construction of the machines recorded by Diades. I shall now set out what I have learned from my teachers and consider useful.

Quae sunt ab Diade de machinis scripta, quibus sint comparationibus, exposui. Nunc quemadmodum a praeceptoribus accepi et utilia mihi videntur, exponam.

I have explained what Diades wrote on the machines, with what comparisons they are. Now I will explain them in the way I received them from my teachers and which seem useful to me.

I have set out what I wrote concerning Diades' machines, with which these may be compared. I shall now explain how I received them from my teachers, and what seems to me useful.

Chapter 14

Textual note — X.13–15. Ancient dimensions are expressed in cubits, feet, palms, fingers and fractions of the torsion opening; these units are not interchangeable. Krohn's adopted figures are distinguished from alternative readings. Where a fractional sign remains uncertain, [...] in the translation records editorial uncertainty; it does not by itself establish a physical lacuna in any manuscript.

1. Testudo, quae ad congestionem fossarum paratur (eaque etiam accessus ad murum potest habere), sic erit facienda. Basis compingatur, quae graece ἐσχάρα dicitur, quadrata habens quoqueversus latera singula pedum XXI et transversaria IIII. Haec autem contineantur ab alteris duobus crassis FS, latis S; distent autem transversaria inter se circiter pedes III S. Supponanturque in singulis intervallis eorum arbusculae, quae graece ἁμαξόποδες dicuntur, in quibus versantur rotarum axes conclusi lamnis ferreis. Eaeque arbusculae ita sint temperatae, ut habeant cardines et foramina, quo vectes traiecti versationes earum expediant, uti ante et post et ad dextrum seu sinistrum latus, sive oblique ad angulos opus fuerit, ad id per arbusculas versatis progredi possint.

1. A tortoise intended for filling ditches, and capable also of reaching the wall, should be built as follows. Assemble a square base, called ἐσχάρα in Greek, twenty-one feet on each side, with four crosspieces. Secure these with two further timbers [...] thick and half a foot wide, leaving about three and a half feet between the crosspieces. Beneath each interval fit supports, called ἁμαξόποδες, in which the iron-plated wheel axles turn. Give the supports pivots and openings for levers, so that they can be turned to move the engine forward, backward, right, left or obliquely as required.

[2] Conlocentur autem insuper basim tigna duo in utramque partem proiecta pedes senos, quorum circa proiecturas figantur altera proiecta duo tigna ante frontes pedes XII, crassa et lata uti in basi sunt scripta. Insuper hanc compactionem erigantur postes compactiles praeter cardines pedum VIIII, crassitudine quoquoversus palmopedales, intervalla habentes inter se sesquipedis. Ea concludantur superne intercardinatis trabibus. Supra trabes conlocentur capreoli cardinibus alius in alium conclusi, in altitudine excitati pedes XII. Supra capreolos conlocetur quadratum tignum, quo capreoli coniungantur.

2. Above the base place two timbers projecting six feet on either side. Around their projecting ends secure two more, extending twelve feet beyond the fronts, with the thickness and width specified for the base. On this assembly erect jointed uprights nine feet high excluding their tenons, one foot and a palm thick on each side, spaced one and a half feet apart. Close them above with tenoned beams. On these set rafters, joined by tenons, rising twelve feet; a square timber above should tie the rafters together.

[3] Ipsi autem laterariis circa fixis contineantur teganturque tabulis maxime palmeis, si non, ex cetera materia, quae maxime habere potest virtutem, praeter pinum aut alnum; haec enim sunt fragilia et faciliter recipiunt ignem. Circum tabulata conlocentur crates ex tenuibus virgis creberrime textae maximeque recentibus. Percrudis coriis duplicibus consutis, fartis alga aut paleis in aceto maceratis, circa tegatur machina tota. ita ab his reicientur plagae ballistarum et impetus incendiorum.

3. Secure them with longitudinal members fixed around the frame, and cover them with planks, preferably of palm, or otherwise of the strongest available timber, excluding pine and alder, which are brittle and readily catch fire. Around the boarding place closely woven hurdles of thin rods, as fresh as possible. Cover the entire engine with very raw hides sewn in two layers and packed with seaweed or straw soaked in vinegar. These will resist the blows of ballistae and attacks by fire.

Chapter 15

[1] Est autem et aliud genus testudinis, quod reliqua omnia habet, quemadmodum quae supra scripta sunt, praeter capreolos, sed habet circa pluteum et pinnas ex tabulis et superne subgrundas proclinatas, supraque tabulis et coriis firmiter fixis continentur. Insuper vero argilla cum capillo subacta ad eam crassitudinem inducatur, ut ignis omnino non possit ei machinae nocere. Possunt autem, si opus fuerit, eae machinae ex VIII rotis esse, si ad loci naturam ita opus fuerit temperare. Quae autem testudines ad fodiendum comparantur (ὀρυκτίδες graece dicuntur), cetera omnia habent, uti supra scriptum est, frontes vero earum fiunt quemadmodum anguli trigoniorum, uti a muro tela cum in eas mittantur, non planis frontibus excipiant plagas sed ab lateribus labentes, sine periculoque fodientes, qui intus sunt, tueantur.

1. Another kind of tortoise follows the same arrangement except for the rafters. It has a surrounding parapet and timber battlements, with sloping eaves above, secured with firmly fixed boards and hides. Spread over them clay kneaded with hair, thick enough to prevent fire from harming the engine. If the ground requires it, these engines may have eight wheels. Tortoises used for digging, called ὀρυκτίδες in Greek, otherwise follow the same construction, but have triangular fronts. Projectiles thrown from the wall then glance off their sloping sides instead of striking a flat face, protecting the men digging within.

[2] Non mihi etiam videtur esse alienum de testudine, quam Hegetor Byzantius fecit, quibus rationibus sit facta, exponere. Fuerat enim eius baseos longitudo pedum LXIII, latitudo XLII. Arrectaria, quae supra compactionem erant quattuor conlocata, ex binis tignis fuerant compacta, in altitudinibus singula pedum XXXVI, crassitudine palmopedali, latitudine sesquipedali. Basis eius habuerat rotas VIII, quibus agebatur. Fuerat autem earum altitudo pedum VI, S÷ crassitudo pedum III, ita fabricata triplici materia: alternis se contra subscudibus inter se coagmentatae lamnisque ferreis ex frigido ductis alligatae.

2. It is also appropriate to explain the construction of the tortoise built by Hegetor of Byzantium. Its base was sixty-three feet long and forty-two wide. Four uprights above the frame were each assembled from two timbers thirty-six feet high, one foot and a palm thick and one and a half feet wide. Eight wheels carried the base. They were six feet and [...] high and three feet thick, built from

three layers of timber joined with alternating opposed tenons and bound with cold-worked iron plates.

[3] Eae in arbusculis, sive amaxopodes dicuntur, habuerant versationes. Ita supra transtrorum planitiem, quae supra basim fuerat, postes erant erecti pedes XVIII, latitudine, S÷ crassitudine, FZ distantes inter se IS÷. Supra eos trabes circumclusae continebant totam compactionem latae pede I, crassae. S÷ Supra eam capreoli extollebantur altitudine pedum XII; supra capreolos tignum conlocatum coniungebat capreolorum compactiones. Item fixa habuerant lateraria in transverso, quibus insuper contabulatio circumdata contegebat inferiora.

3. The wheels turned in supports called amaxopodes. Above the surface of the crosspieces over the base rose posts eighteen feet high, [...] wide and [...] thick, spaced [...] apart. Surrounding beams one foot wide and [...] thick held the assembly together. Rafters rose twelve feet above them, tied at the top by a timber connecting their joints. Transverse longitudinal members were also fixed in place, carrying boarding that enclosed the lower parts.

[4] Habuerat autem mediam contabulationem supra trabiculas, ubi scorpiones et catapultae conlocabantur. erigebantur Et arrectaria duo compacta pedum XXXXV, crassitudine sesquipedali, latitudine, PII coniuncta capitibus transversario cardinato tigno et altero mediano inter duos scapos cardinato et lamnis ferreis religato. Quo insuper conlocata erat alternis materies inter scapos et transversarium traiecta e cheloniis et anconibus firmiter inclusa. In ea materia fuerunt ex torno facti axiculi duo, e quibus funes alligati retinebant arietem.

4. An intermediate deck rested on smaller beams and carried scorpions and catapults. Two jointed uprights rose forty-five feet, one and a half feet thick and [...] wide. A transverse timber joined their upper ends by tenons, while another joined the two longitudinal members midway and was bound with iron plates. Above it lay a further timber across the longitudinal members and crosspiece, firmly secured with chelonia and angle pieces. Two small turned axles in this timber carried the ropes from which the ram hung.

5. Supra caput eorum, qui continebant arietem, conlocatum erat pluteum turriculae similitudine ornatum, uti sine periculo duo milites tuto stantes prospicere possent et renuntiare, quas res adversarii conarentur. Aries autem eius

habuerat longitudinem pedum CLXXX, latitudine in imo palmopedali, crassitudine ⟨bi⟩pedali, contracto capite in latitudine †pes, crassitudine S.

5. Above the heads of the men supporting the ram stood a parapet resembling a small tower, allowing two soldiers to stand safely, observe the enemy and report their intentions. The ram was one hundred and eighty feet long, one foot and a palm wide at the bottom and two feet thick. Its head tapered to a width of †one foot† and a thickness of half a foot.

[6] Is autem aries habuerat de ferro duro rostrum, ita uti naves longae solent habere, et ex ipso rostro lamminae ferreae IIII circiter pedum XV fixae fuerant in materia.

[6] The ram had a beak of hard iron, such as is fitted to long warships. Four iron plates, each about fifteen feet long, were fastened to its timber from the beak itself.

A capite autem ad imam calcem tigni contenti fuerunt funes III crassitudine digitorum VIII, ita religati, quemadmodum naves a puppi ad proram continentur, eique funes praecinctura e transversis erant religati habentes inter se palmipedalia spatia. Insuper coriis crudis totus aries erat involutus. Ex quibus autem funibus pendebat, eorum capita fuerunt ex ferro factae quadruplices catenae, et ipsae coriis crudis erant involutae.

Three ropes, each eight fingers thick, ran from the head to the lower end of the beam, secured like the ropes binding a ship from stern to bow. Cross-bands held them at intervals of one foot and a palm. The entire ram was wrapped in raw hides. The ends of its suspension ropes were fourfold iron chains, also covered with raw hides.

*7. Item habuerat proiectura eius ex tabulis arcam compactam et confixam, in qua * * * rudentibus maioribus extentis, per quarum asperitates non labentibus pedibus faciliter ad murum perveniebatur. Atque ea machina sex modis movebatur: progressu, ⟨regressu,⟩ item latere dextra et sinistra, porrectiones non minus in altitudinem extollebantur et in imum inclinatione demittebantur. Erigebatur autem machina in altitudinem ad disiciendum murum circiter pedes C, item a latere dextra ac sinistra procurrendo praestringebat non minus*

pedes C. Gubernabant eam homines C habentem pondus talentûm quattuor milium, quod fit C̄C̄C̄L̄X̄X̄X̄ pondo.[167]

7. The projecting structure also carried a box assembled and fixed from planks, in which * * * larger ropes were stretched. Their rough surface gave the feet a secure hold and allowed easy access to the wall. The engine moved in six ways: forwards and ⟨backwards⟩, to the right and left, and by raising or lowering its projecting parts. It could be raised to attack a wall about one hundred feet high and could sweep across a comparable distance to either side. One hundred men operated the machine, which weighed four thousand talents, equivalent in the text to 480,000 Roman pounds.

COMPARATIVE CRITICAL APPARATUS — X.15. Hegetor's tortoise is described with one of the most unstable sets of numerals in Book X. Against a textual tradition giving a base of LX × XIII feet and a ram of CIV feet, the critical constitution adopted in the author's Spanish edition reads LXIII × XLII and CLXXX, respectively, and also restores ⟨bi⟩pedali for the thickness of the lower part of the ram. The fractional measures of the wheels, posts and ram-head remain damaged or disputed. Accordingly, this edition marks uncertain readings and does not reconstruct missing dimensions merely by proportional inference.

NOTE ON HISTORICAL ENGINEERING — X.15. The importance of this passage lies less in the possibility of reconstructing one machine to millimetric accuracy than in its structural logic: a mobile base capable of movement in several directions, layered protection against missiles and fire, a platform for artillery, a suspended battering ram, and control over the approach to the wall. The unstable numerals demonstrate why the description must be read as a transmitted technical document rather than as a modern set of working drawings.

COMPARATIVE CRITICAL APPARATUS — X.15. In accounts of the machines built by Hegetor and other engineers, proper names, dimensions, and relationships between structural members are textual-critical risk points.

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167 Krohn (1912), p. 257, prints CCCCLXXX with a bar, followed by pondo. The bar marks thousands: the expanded figure is 480,000 Roman pounds. The unbarred or truncated digital transcription must not be read as 400 or 480 pounds.

Priority is given to the critically adopted reading; only variants affecting geometry, load transfer or the identification of components are specifically noted.

TEXTUAL AND MECHANICAL NOTE — RECONSTRUCTIONS. Where the Latin syntax permits more than one material arrangement, the edition must not silently select a reconstruction. The translation preserves the ambiguity, and any graphic reconstruction is expressly labeled and justified in an accompanying note.

Chapter 16

[1] De scorpionibus et catapultis et ballistis etiamque testudinibus et turribus, quae maxime mihi videbantur idonea et a quibus essent inventa et quemadmodum fieri deberent, explicui. Scalarum autem et carchesiorum et eorum, quorum rationes sunt inbecilliores, non necesse habui scribere. Haec etiam milites per se solent facere. Neque ea ipsa omnibus locis neque eisdem rationibus possunt utilia esse, quod differentes sunt munitiones munitionibus nationumque fortitudines. Namque alia ratione ad audaces et temerarios, alia ad diligentes, aliter ad timidos machinationes debent comparari.

1. I have explained the construction of scorpions, catapults, ballistae, tortoises and towers, identifying their inventors and the arrangements I considered most suitable. I have not thought it necessary to describe ladders, carchesia and other simpler devices, since soldiers commonly make these for themselves. The same engines cannot serve every site or follow identical rules: fortifications differ, as does the resolve of their defenders. One kind of engine is needed against the bold and reckless, another against the vigilant, and another against the fearful.

[2] Itaque his praescriptionibus si qui attendere voluerit ⟨et⟩ ex varietate eorum eligendo in unam comparationem conferre, non indigebit auxiliis, sed quascumque res ex rationibus aut locis opus fuerit, sine dubitatione poterit explicare. De repugnatoriis vero non est scriptis explicandum. Non enim ad nostra scripta hostes comparant res oppugnatorias, sed machinationes eorum ex tempore sollerti consiliorum celeritate sine machinis saepius evertuntur. Quod etiam Rhodiensibus memoratur usu venisse.

2. Anyone who attends to these prescriptions and combines appropriate elements from their variety into a single construction will need no further assistance, but will be able to solve the requirements of the design and the site without hesitation. Defensive devices, however, cannot be prescribed in writing in the same way. The enemy does not prepare its siege engines according to our books; its machinery is often defeated without machinery, through quick and shrewd decisions taken as circumstances arise. Such an event is recorded at Rhodes.

[3] Diognetus enim fuerat Rhodius architectus, et ei de publico quotannis certa merces pro artis dignitate tribuebatur ad honorem. Eo tempore quidam

architectus ab Arado nomine Callias Rhodum cum venisset, acroasin fecit exemplarque protulit muri et supra id machinam in carchesio versatili constituit, quae helepolim ad moenia accedentem corripuit et transtulit intra murum. Hoc exemplar Rhodii cum vidissent, admirati ademerunt Diogneto, quod fuerat quotannis constitutum, et eum honorem ad Calliam transtulerunt.

3. Diognetus was the Rhodians' architect and received a fixed annual payment from public funds in recognition of his professional standing. An architect from Aradus named Callias arrived at Rhodes, gave a lecture and presented a model wall. Above it he installed a machine on a rotating carchesium, which seized a helepolis approaching the fortifications and transferred it inside. Astonished by the demonstration, the Rhodians withdrew Diognetus's annual allowance and conferred it on Callias.

4. Interea rex Demetrius, qui propter animi pertinaciam Poliorcetes est appellatus, contra Rhodum bellum comparando Epimachum Atheniensem nobilem architectum secum adduxit. Is autem comparavit helepolim sumptibus inmanibus industria laboreque summo, cuius altitudo fuerat pedum CXXXV, latitudo pedum LX. Ita eam ciliciis et coriis crudis confirmavit, ut posset pati plagam lapidis ballista inmissi pondo CCCLX; ipsa autem machina fuerat milia pondo CCCLX. Cum autem Callias rogaretur ab Rhodiis, contra eam helepolim machinam pararet, ut illam, uti pollicitus erat, transferret intra murum, negavit posse.

4. Meanwhile King Demetrius, called Poliorcetes for his persistence, prepared for war against Rhodes and brought with him the distinguished Athenian architect Epimachus. At immense expense and with exceptional skill and labor, Epimachus built a helepolis one hundred and thirty-five feet high and sixty wide. He strengthened it with goat-hair cloth and raw hides so that it could withstand a ballista stone weighing three hundred and sixty pounds. The engine itself weighed three hundred and sixty thousand pounds. When the Rhodians asked Callias to construct the device he had promised to carry this helepolis inside the wall, he admitted that he could not.

[5] Non enim omnia eisdem rationibus agi possunt, sed sunt alia, quae exemplaribus non magnis similiter magna facta habent effectus; alia autem exemplaria non possunt habere, sed per se constituuntur; nonnulla vero sunt, quae in exemplaribus videntur veri similia, cum autem crescere coeperunt, dilabantur.

Ut etiam possumus sic animum advertere. Terebratur terebra foramen semidigitale, digitale, sesquidigitale. Si eadem ratione voluerimus palmare facere, non habet explicationem, semipedale autem ⟨aut⟩ maius ne cogitandum quidem videtur omnino.

5. Not everything can be achieved by the same methods. Some devices retain their effect when enlarged from small models; others can only be established at full size; and others seem plausible in a model but fail as their scale increases. A drill illustrates the point. It can bore a hole half a finger, one finger or one and a half fingers wide. The same method cannot simply be extended to a hole a palm wide, and one half a foot wide or larger scarcely seems worth considering.

[6] Sic item in nonnullis exemplaribus videntur, quae admodum in minimis fieri videntur, absque eodem modo in maioribus. ideo eodem modo Rhodii ea de ratione decepti iniuriam cum contumelia Diogneto fecerunt. Itaque posteaquam viderunt hostem pertinaciter infestum,, machinationem ad capiendam urbem comparatam, periculum servitutis, vastitatem civitatis expectandam, procubuerunt Diogneto rogantes, ut auxiliaretur patriae.

6. In the same way, what appears practicable in a very small model may fail at a larger scale. Misled by such reasoning, the Rhodians had dishonored Diognetus. When they saw the enemy's determination, the machinery prepared to take their city and the prospect of enslavement and devastation, they prostrated themselves before him and begged him to save his country.

[7] Is primo negavit se facturum. Posteaquam ingenuae virgines et ephebi cum sacerdotibus venerunt ad deprecandum, tunc est pollicitus his legibus, uti, si eam machinam cepisset, sua esset. his ita constitutis, qua machina accessura erat, ea regione murum pertudit et iussit omnes publice et privatim quod quisque habuisset aquae, stercoris, luti per eam fenestram per canales progredientes effundere ante murum. Cum ibi magna vis aquae, luti, stercoris nocte profusa fuisset, postero die helepolis accedens, antequam adpropinquaret ad murum, in umido voragine facta consedit nec progredi nec egredi postea potuit. Itaque Demetrius, cum vidisset sapientia Diogneti se deceptum esse, cum classe sua discessit.

[7] At first Diognetus refused. When the freeborn maidens and youths came with the priests to plead with him, he agreed on condition that, if he captured the machine, it would belong to him. Once this was settled, he pierced the wall

where the engine was expected to approach. He ordered everyone, acting publicly and privately, to pour whatever water, manure and mud they had through the opening and along projecting channels in front of the wall. A great quantity was discharged there during the night. The next day, as the helepolis advanced, it sank into the sodden ground before reaching the wall and could neither move forward nor withdraw. Demetrius, realizing that Diognetus's ingenuity had defeated him, departed with his fleet.

[8] Tunc Rhodii Diogneti sollertia liberati bello publice gratias egerunt honoribusque omnibus eum et ornamentis exornaverunt. Diognetus eam helepolim reduxit in urbem et in publico conlocavit et inscripsit 'Diognetus e manubiis id populo dedit munus'. Ita in repugnatoriis rebus non tantum machinae, sed etiam maxime consilia sunt comparanda.

[8] Then the Rhodians, freed from the war by the skill of Diognetus, gave him public thanks and honored him with every distinction and adornment. Diognetus brought that *helepolis* back into the city, set it up in the public square, and inscribed upon it: "Diognetus gave this gift to the people from the spoils of war." Thus in matters of defense it is not engines so much as the ingenuity to outwit engines that must be made ready.

Editorial note. — The siege of Rhodes by Demetrius Poliorcetes (305–304 BCE) and the helepolis of Epimachus were famous in antiquity. Vitruvius ends the entire treatise not with a machine but with a lesson: Diognetus saves the city not by greater force but by guile, miring the great tower in flooded ground. The closing maxim — that defense depends less on engines than on the architect's ingenuity — is the fitting envoi of a work that throughout subordinates technique to judgment.

[9] Non minus Chio cum supra naves sambucarum machinas hostes comparavissent, noctu Chii terram, harenam, lapides progesserunt in mare ante murum. Ita illi postero die cum accedere voluissent, naves supra aggerationem, quae fuerat sub aqua, sederunt nec ad murum accedere nec retrorsus se recipere potuerunt, sed ibi malleolis confixae incendio sunt conflagratae. Apollonia quoque cum circumsederetur et specus hostes fodiendo cogitarent sine suspicione intra moenia penetrare, id autem a speculatoribus esset Apolloniatibus renuntiatum, perturbati nuntio propter timorem consiliis indigentes animis deficiebant, quod neque tempus neque certum locum scire poterant, quo emersum facturi fuissent hostes.

9. At Chios, when the enemy fitted ships with sambucae, the inhabitants cast earth, sand and stones into the sea before the wall during the night. The next day the approaching ships grounded on the submerged bank. Unable either to reach the wall or to withdraw, they were struck by incendiary missiles and destroyed by fire. At Apollonia, the besiegers intended to enter the city secretly through tunnels. When spies reported this to the inhabitants, fear left them at a loss: they could establish neither the time nor the precise place where the enemy would emerge.

[10] Tum vero Trypho Alexandrinus ibi fuerat architectus; ⟨is⟩ intra murum plures specus designavit et fodiendo terram progrediebatur extra murum dumtaxat extra sagittae missionem et in omnibus vasa aenea suspendit. Ex his in una fossura, quae contra hostium specus fuerat, vasa pendentia ad plagas ferramentorum sonare coeperunt. Ita ex eo intellectum est, qua regione adversarii specus agentes intra penetrare cogitabant, Sic lineatione cognita temperavit aenea aquae ferventis et picis de superne contra capita hostium et stercoris humani et harenae coctae candentis. Dein noctu pertudit crebra foramina et per ea repente perfundendo qui in eo opere fuerunt hostes omnes necavit.

10. Trypho of Alexandria was then the architect there. He marked out several galleries inside the wall and drove them outward only as far as an arrow could reach, hanging bronze vessels in all of them. In the gallery opposite the enemy's tunnel, the suspended vessels began to ring with the blows of the digging tools, revealing where the attackers intended to break through. Once he had determined their direction, he prepared cauldrons of boiling water and pitch above them, together with human dung and red-hot sand. During the night he pierced numerous openings and suddenly poured these materials through, killing the men working below.

[11] Item Massilia cum oppugnaretur et numero supra XXX specus tum agerent, Massilitani suspicati totam quae fuerat ante murum fossam altiore fossura depresserunt. Ita specus omnes exitus in fossam habuerunt. Quibus autem locis fossa non potuerat fieri, intra murum barathrum amplissima longitudine et amplitudine uti piscinam fecerunt contra eum locum, qua specus agebantur, eamque e puteis et e portu impleverunt. Itaque cum specus esset repente naribus apertis, vehemens aquae vis inmissa supplantavit fulturas, quique intra fuerunt, et ab aquae multitudine et ab ruina specus omnes sunt oppressi.

11. Likewise, when Massilia was besieged and the enemy drove more than thirty tunnels towards it, the inhabitants suspected the attempt and deepened the whole ditch before the wall, so that every tunnel opened into it. Where a ditch could not be dug, they excavated a very long and broad basin inside the wall, opposite the approaching tunnels, and filled it from the wells and harbour. When the tunnel mouths suddenly broke through, the rush of water undermined their supports. Those inside were overwhelmed by the water and the collapsing galleries.

[12] Etiam cum agger ad murum contra eos compararetur et arboribus excisis eoque conlocatis locus operibus exaggeraretur, ballistis vectes ferreos candentes in id mittendo totam munitionem coegerunt conflagrare. Testudo autem arietaria cum ad murum pulsandum accessisset, permiserunt laqueum et eo ariete constricto, per tympanum ergata circumagentes suspenso capite eius non sunt passi tangi murum. Denique totam machinam malleolis candentibus et ballistarum plagis dissipaverunt. Ita eae victoriae civitatum ⟨civitates⟩ non machinis, sed contra machinarum rationem architectorum sollertia sunt liberatae.

12. When a siege mound was built against their wall and raised with felled trees and other works, they fired red-hot iron bars into it with ballistae and set the whole structure ablaze. When a ram-bearing tortoise approached the wall, they lowered a noose, caught the ram and used a capstan and drum to suspend its head, preventing it from striking the masonry. Finally they destroyed the entire engine with burning missiles and ballista shots. These cities were thus saved through the ingenuity of architects who defeated the principles of the enemy's machinery, rather than through machinery alone.

Quas potui de machinis expedire rationes pacis bellique temporibus et utilissimas putavi, in hoc volumine perfeci. In prioribus vero novem de singulis generibus et partibus comparavi, uti totum corpus omnia architecturae membra in decem voluminibus haberet explicata.

I have set forth in this volume such principles of machines as I could expound, for times of peace and of war, judging them the most useful; and in the preceding nine I have treated severally of the other kinds and parts, so that the whole body of architecture, in all its members, might be set forth in ten volumes.

Textual and technical note — Book X. The Latin has been checked against Krohn's edition of 1912, with the Spanish authorial text

controlling the English interpretation. Reported variants and conjectural supplements remain distinct from direct manuscript evidence. In X.10–15, uncertain fractional signs and damaged dimensions are not silently converted into complete modern measurements. In X.11.3, CC et X⟨L pondo⟩ gives 240 pounds; in X.14.2 the adopted rafter height is twelve feet; and the adopted figures in X.15 include a base of 63 × 42 feet and a ram 180 feet long. The helepolis in X.16.4 is 135 feet high. These readings must be distinguished from alternative figures found in the printed tradition. Neither a reconstructed machine nor the apparent plausibility of a modern drawing independently establishes a manuscript reading.

ARGUMENTUM LIBRI X — VITRUVIUS DEFINES THE MACHINE AND DISTINGUISHES IT FROM THE INSTRUMENT, THEN EXAMINES HOISTING DEVICES AND THEIR TACKLE, WATER-RAISING MECHANISMS, THE WATER-SCREW, CTESIBIUS'S PUMP, THE HYDRAULIC ORGAN, AND THE ODOMETER. HE PROCEEDS TO CATAPULTS, BALLISTAE, AND SIEGE ENGINES, INCLUDING RAMS AND TORTOISES, AND CONCLUDES WITH METHODS OF DEFENSE.

Notice. *— Book X treats machines. It distinguishes machina from organon, then describes hoisting engines and their tackle, water-raising devices (the bucket-wheel, the Archimedean screw, the water-organ and the water-mill), the odometer, and finally the engines of war — catapults and ballistae, the tortoise and siege-towers — closing with stratagems of defense. It is the fullest ancient account of classical mechanical and military technology.*

M. VITRVVIVS POLLIO

(c. 80/70 – c. 25 BCE)

DE ARCHITECTVRA

Foreign editions

Vitruvio Poli and Marco - 1521 - Editions by Alessandro Rovetta. Milan: Vita e Pensiero, 2002

Cesariano's 1521 Como edition was the first printed Italian translation of Vitruvius. It combined a substantial commentary with woodcuts, including comparisons drawn from Milan Cathedral. Near the end of Book IX, editorial control passed from Cesariano to the collaborators and sponsors who completed the work using his materials. The Biblioteca Universitaria di Padova records the resulting conflict, his imprisonment, and a legal settlement in his favor in 1528. The episode belongs to the history of the edition's production, not to the ancient text.

Vitruvius Pollio, Marco - 1522 - Printing in Florence by haeredes Philippi Iuntae

The 1522 edition, printed in Latin and with few illustrations, is essentially the same as the 1513 edition published by Giunta, with the difference that the errors of the first edition were corrected in this one. The figures used are exactly the same.

Vitruvius Pollio, Marco - 1567 - Venice: apud Franciscum Franciscium Senesem & Ioan Crugher Germanum

Barbaro's version, the fourth Italian translation of this treatise, surpassed Cesariano's in both translation quality and illustrations. It was published in Venice in 1556 and reprinted several times. For its illustrations, he had the exceptional collaboration of Andrea Palladio, who designed some of the drawings that were later engraved.

Vitruvius Pollio, Marco - 1684 - Paris: chez Jean Baptiste Coignard, imprimeur

In France, the translation by the French scientist Claude Perrault was widely known. First published in 1673, the Library's edition preserves the revised and expanded second edition. This expansion is notable for the addition of new bibliographical notes and previously unpublished plates, as well as corrections to the original text. This edition is particularly appreciated for its exquisite illustrations.

Vitruvio Pollio, Marco - 1758 - Naples: in the Simoniana Printing House

Berardo Galiani's 1758 edition presents the Latin text with an Italian translation and commentary. Its eighteenth-century date precludes a personal collaboration with Andrea Palladio, who died in 1580; any relationship to Palladian illustration belongs to the reuse and reception of earlier material.

Spanish Editions

Ruiz Hernán, the Younger - 16th Century - Facsimile reproduction. Madrid, Polytechnic University, 2005

Hernán Ruiz's manuscript, written around 1558–1564, includes one of the earliest Spanish versions of Vitruvius's work. However, the translation, limited to Book One, is considered unsuccessful, with some parts better translated than others.

Vitruvius Pollio, Marco - Cáceres, Cicon, 1999 - Reprod. f to c. from Manuscript Mss-2 from the year 1564 preserved in the Public Library of Cáceres.

Lázaro de Velasco's manuscript is not only a translation, but also a valuable document for the study of the architecture of his time due to the annotations and commentaries that enrich the text. Lázaro de Velasco consulted various Italian copies and translations of Vitruvius's treatise, and his manuscript became the first translation into Spanish in Spain.

Vitruvio Pollio, Marco - Alcalá de Henares: by Juan Gracián, 1582

The first printed edition in Spain of Vitruvius's work was the translation by Miguel de Urrea. Published in 1582, this edition featured 126 woodcut engravings, and although it has been considered "crude and lacking in literary style," it was an important attempt to translate Vitruvius's treatise into Castilian Spanish.

Vitruvius Pollio, Marcus - Madrid: at the Royal Printing Press, year 1787

The third Spanish edition of Vitruvius's treatise was produced by José Ortiz y Sanz. Ortiz y Sanz, a great humanist, combined his philological knowledge with his interest in architecture. His manuscript, published in 1787, included 56 plates designed by himself and engraved by leading engravers of the time. This edition was used for teaching architecture in Spain.

Vitruvius Pollio, Marcus — Madrid: Alianza Editorial, 1995

Spanish version by José Luis Oliver Domingo, with an introduction by Delfín Rodríguez Ruiz (Alianza Forma collection). It is the most widely distributed modern Castilian translation of the ten books; it is a translation, not a bilingual edition, since it does not reproduce the facing Latin text.

Critical editions and fundamental commentaries

- Vitruve. De l'architecture, Livre I. Edited and translated by Philippe Fleury. Collection des Universités de France. Paris: Les Belles Lettres, 1990.
- Vitruvius. Ten Books on Architecture. Translated by Ingrid D. Rowland; commentary and illustrations by Thomas Noble Howe, with additional commentary by Ingrid D. Rowland and Michael J. Dewar. Cambridge: Cambridge University Press, 1999.

Studies on theory and reception

- Carpo, Mario. *The Second Digital Turn: Design Beyond Intelligence*. Cambridge, MA: MIT Press, 2017.

Technical and historical studies

- Haselberger, Lothar. Urbem adornare: Die Stadt Rom und ihre Gestaltumwandlung unter Augustus / Rome's Urban Metamorphosis under Augustus. English translation of the main text by Alexander Thein. Journal of Roman Archaeology Supplementary Series 66. Portsmouth, RI: Journal of Roman Archaeology, 2007.

Reception and historical criticism

- Senseney, John R. The Art of Building in the Classical World: Vision, Craftsmanship, and Linear Perspective in Greek and Roman Architecture. Cambridge: Cambridge University Press, 2011.

Resources for academic research

1. Philological approach: For research on ἀρχή and Vitruvian technical terminology, the individual volumes of the Collection des Universités de France (Budé; Les Belles Lettres) supply critically established Latin texts and detailed scholarly apparatus.

2. **Contextualization:** The works of **Lothar Haselberger** are indispensable for any modern researcher, as they correct the romantic view of Vitruvius, placing him as an architect with political ambitions in the court of Augustus.

3. **Access:** Many of these texts are available on platforms such as *JSTOR* or *Academia.edu*, where it is possible to find specific chapters on the influence of Janus and the ritualization of space described by Vitruvius.

"While Vitruvius's testimony confirms the Pythagorean tradition's interest in the arithmetic properties of the number 216 — the cubic product of six — it is imperative to distinguish between the historical reference and contemporary speculative readings. Although Vitruvius documents the validity of these numerical systems in classical thought, the projection of symbolic or metaphysical content onto these numbers lacks documentary support and belongs, rather, to the realm of interpretive hermeneutics than to that of architectural historiography."

About the formation of the architect: *"Architecture is* a science furnished with many disciplines and diverse fields of knowledge, by whose judgment all the works produced by the other arts are appraised." [Vitruvius, *De architectura*, Book I, 1.1].

APPENDIX A

GLOSSARY OF VITRUVIAN TECHNICAL TERMS

This glossary brings together the principal technical terms used by Vitruvius in his De architectura, with their Latin form, the Greek spelling where appropriate, and their academic definition. In each case, the relevant passage in the treatise where the term is defined or appears with greater precision is indicated.

ARCHITECTURE. The discipline that arises from the union between fabrica (constructive practice) and ratiocinatio (theoretical reasoning). Vitruvius defines it in De architectura 1.1.1: "Architecture is a science furnished with many disciplines and diverse fields of knowledge branches of learning." Its implicit Greek equivalent is ἀρχιτεκτονική (architektoniké).

CUBE [κύβος]. The cube, a geometrical figure of six equal square faces. Vitruvius employs it in the preface to Book V to explain the Pythagorean cubic ratio: The number 216 (= 6^3) was the conventional measure of a writing volume. « A cube is a body with sides of equal width on flat surfaces » (De architectura 5.praef.3).

CYBICIS RATIONIBUS. « Cubic ratios ». Pythagorean expression that designates the organization of knowledge in volumes of 216 verses (= 6^3). Cf. De architectura 5.praef.3; Krohn (1912), 100.

***DECOR*.** The suitability or correctness of the appearance of a work, obtained through the appropriate application of the principles of use, custom, and nature. "*Decor* autem est emendatus operis aspectus probatis rebus compositi cum auctoritate" (De architectura 1.2.5). It should not be confused with "decoration" in the modern ornamental sense.

DISPOSITIO [διάθεσις]. Layout or conception of the plan, elevation and perspective of a building. It involves the three forms of representation: ichnographia (plan), orthographia (elevation) and scaenographia (perspective). Cf. De architectura 1.2.1 – 2.

DISTRIBUTIO [οἰκονομία]. The administration Suitable materials and terrain, with economic balance. Includes adapting the design to the owner's status and use. Cf. De architectura 1.2.8 – 9.

ECHEA [ἠχεῖα, sing. ἠχεῖον]. Bronze vessels (vasaenea) tuned according to musical intervals, placed in niches under the tiers of theaters to amplify and clarify the voices of the actors. They constitute the foundation of Vitruvian acoustic architecture. Cf. De architectura 1.1.9 and 5.5.1 – 8.

ENCYCLIOS DISCIPLINA. Encyclopedic education. The comprehensive training program that Vitruvius requires of the architect: writing, drawing, geometry, arithmetic, history, philosophy, music, medicine, law, and astronomy. Cf. De architectura 1.1.12.

EURYTHMIA [εὐρυθμία]. The graceful and proportionate appearance in the composition of the members of a work. It results from the correct application of symmetry. « *Eurythmia* est venusta species commodusque in compositionibus membrorum aspectus » (De architectura 1.2.3).

FABRICA. The constructive practice: " continuous and practised experience of construction, by which the intended work is executed by hand." Together with ratiocinatio, it constitutes the origin of architectura. Cf. De architectura 1.1.1.

FIRMITAS. Structural solidity. The first condition of all architectural work, achieved "when the foundations are carried down to firm ground and when the choice of materials is made without avarice. " Cf. De architectura 1.3.2.

GNOMONICS [γνωμονική]. The art of measuring time using the gnomon (sundial) and other instruments. Vitruvius dedicates Book IX to it. The gnomon is the rod whose shadow indicates the time.

ICHNOGRAPHY [ἰχνογραφία]. Horizontal plan or projection of a building, plotted with ruler and compass. One of the three forms of architectural representation described by Vitruvius. Cf. De architectura 1.2.2.

ORDINATIO [τάξις]. The ordering or modular arrangement of the members of a work, taking as a reference a unit of measurement (m o dule). "*Ordinatio* is t he balanced adjustment of the members of a work taken separately, and of the whole with regard to proportion" (De architectura 1.2.2).

ORTHOGRAPHY [ὀρθογραφία]. Elevation or vertical representation of the façade of a building, at the correct scale. Second of the three forms of Vitruvian representation. Cf. De architectura 1.2.2.

RATA PARS. The " determined part " or reference module from which the proportions of a work are established. In temples, the module is the semi - diameter of the column. Cf. De architectura 1.2.4.

RATIOCINATIO. Theoretical reasoning applied to construction: " that which can show and explain through skill, method and proportion the works carried out. " Cf. De architectura 1.1.1.

SCAENOGRAPHIA [σκηνογραφία]. Perspective or foreshortened representation of facades and lateral parts of a building. Third form of Vitruvian representation. Cf. De architectura 1.2.2.

SCAMILLI IMPARES. The "irregular wedges" or curvilinear corrections of the stylobate of temples, intended to compensate for the optical illusion of sinking on long horizontal surfaces. Cf. De architectura 3.4.5 and Rowland and Howe (1999), 51.

SYMMETRIA [συμμετρία]. The proportional correspondence between the members of a work and the whole, taken from a rata pars (reference part). « *Symmetria* est ex ipsius operis membris conveniens consensus » (De architectura 1.2.4). It differs from the modern meaning of « bilateral symmetry ».

UTILITAS. Functional utility. The second Vitruvian condition: the arrangement of spaces must be irreproachable and present no obstacles to use. Cf. De architectura 1.3.2.

VENUSTAS. Elegance or beauty of appearance. The third Vitruvian condition, achieved when " the appearance of the work is pleasing and in good taste, and when the proportions of the members are calculated according to the principles of symmetry. " Cf. De architectura 1.3.2. The term derives from Venus (goddess of beauty) and connotes proportional grace, not mere ornamentation.

ABACUS [ἄβαξ]. The abacus: a square slab that crowns the capital and receives the architrave. Its proportion varies according to the order.

ASTRAGALUS [Astragalus]. Small convex molding of semicircular section (also tondino), used at the transition between fuste and capitel.

COLUMN. The vertical support composed of a base (except in the Vitruvian Doric), shaft (scapus) and capital (capitulum). Its height/diameter ratio defines the order.

CORINTHIUS (ordo). The Corinthian order, the most slender and ornate, characterized by the acanthus leaf capital; Vitruvius recounts its invention by Callimachus (4.1).

DIASTICLES [διάστυλος]. Wide intercolumniation, of three diameters between columns (3.3).

DORICUS (ordo). The Doric order, the most robust, based on its Vitruvian form, with a frieze of triglyphs and metopes (4.3).

ENTASIS [ἔντασις]. The slight bulging or convex tension of the column shaft, intended to correct the optical illusion of concavity (3.3.13).

EUSTYLOS [εὔστυλος]. The optimal intercolumniation according to Vitruvius, of two and a quarter diameters, which reconciles beauty and solidity (3.3.6).

IONICUS (ordo). The Ionic order, intermediate in slenderness, recognizable by the volutes of the capital; Vitruvius dedicates the core of Book III to it.

MODULUS. The module: unit of measurement (in Vitruvius, generally the radius or lower diameter of the column) with which the entire building is dimensioned by *symmetria*.

MUTULUS. The mutule: projecting block under the Doric cornice, vestige of the beam heads; it bears the guttae.

PERIPTERAL [περίπτερος]. Temple surrounded by a single row of freestanding columns on its four sides (3.2).

PYCNOSTYLOS [πυκνόστυλος]. Narrow intercolumniation, one and a half diameters between columns (3.3).

PRONAOS [πρόναος]. The portico or front vestibule of the temple, in front of the cella.

STYLOBATA [στυλοβάτης]. The stylobate: upper platform or step on which the columns rest; object of the optical correction of odd scamilli.

SYSTYLOS [σύστυλος]. Intercolumn of two diameters between columns (3.3).

TETRASTYLOS [τετράστυλος]. With four columns on the front; applied to porticoes and atriums.

TRIGLYPHUS [τρίγλυφος]. The triglyph: element of the Doric frieze with two full and two half channels, alternating with the metopes.

TUSCANICUS (ordo). The Tuscan order, a simplified Italic variant of the Doric, described by Vitruvius in 4.7.

AREOSTYLOS [ἀραιόστυλος]. Very wide intercolumniation, greater than three diameters, typical of archaic temples with wooden architrave (3.3).

CELLA. The cella or naos: enclosed area of the temple that houses the image of the deity.

METOPE [μετόπη]. The metope: a square space, plain or sculpted, between two triglyphs of the Doric frieze.

PORTICUS. The portico: a covered colonnaded gallery; a recurring element in the public buildings of Book V.

CONTIGNATIO. The framework of beams and flooring of a floor; technical term of wood construction (Books IV and VI).



Figure 18. Royal cubit rod of Amenemope, reign of Horemheb, 1319–1292 BCE; wood, length 52.5 cm. Museo Egizio, Turin, Cat. 6347. Institutional photograph, CC0, reproduced through Wikimedia Commons. This Egyptian royal cubit must be distinguished from the Roman cubit.

APPENDIX C.1

ANALYTICAL INDEX

Selected references to discussions in this composition. Repeated mentions within indexes are excluded.

VITRUVIAN TECHNICAL TERMS

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WORKS AND TEXTS

De architectura (editions), 1, 6–7, 9–10, 12, 14–16, 19–28, 31, 33–34, 36–38, 40–42, 44–45, 47, 49–50, 54, 58, 60, 62, 65–66, 69, 71, 73–77, 79, 83–85, 87–88, 91, 93, 101, 104–105, 107, 109, 111–113, 124, 127–130, 132–133, 136, 138–139, 150, 154, 158–161, 163–167, 170–171, 173–174, 176, 180, 185, 189, 192–195, 198, 200, 203–204, 206, 208, 211, 213–214, 216, 220, 223, 228, 231–232, 235, 278–281, 284–291, 294–298, 301–304, 306–309, 311–324, 326–331, 333, 335–336, 338–339, 341–344, 347, 349–350, 352, 354, 356, 361–363, 368–372, 374–375, 377–378, 382–383, 385–386, 388, 390, 392–395, 397–398, 402–403, 405–406, 470–471, 514, 554, 576, 618, 682, 776, 840, 910–913, 928–932, 943–944, 950, 952, 955, 960, 964, 971, 973, 981, 983, 985–986, 988–990, 997–998, 1001–1002, 1004–1005, 1008, 1010, 1012, 1014, 1018, 1028, 1030–1032, 1034–1035, 1040, 1042

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APPENDIX C.2 · THEMATIC INDEX OF ARCHITECTURAL CONCEPTS

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The ideal architect (the architect's education) — I.1

Encyclios disciplina (encyclopedic formation) — 1.1.12

Fabrica and ratiocinatio — I.1

The Vitruvian triad: *firmitas*, *utilitas*, *venustas* — 1.3.2

The six principles (*ordinatio*, *dispositio*, *eurythmia*, *symmetria*, *decor*, *distributio*) — I.2

Symmetria (commensurability) — I.2; III.1

Eurythmia — 1.2.3

Decor (propriety, appropriateness) — 1.2.5

Module (modulus) — III.1; IV

Proportion and analogy — III.1

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The golden section and golden ratio — presented here only as a modern interpretive hypothesis, without warrant in Vitruvius's own text

The number 216 and the duplication of the cube — the author's hermeneutic proposal

12. GENERAL CONCEPTS

Summum templum architecturae — 1.1.11

Architecture as an imitation of nature

Vitruvius Today

The Continuing Life of a Canon

De architectura remains an active point of reference in architectural culture. Its contemporary value lies in the questions it brings together: how a building stands, how it serves its users, how its parts form an intelligible whole, and how the architect acquires the knowledge needed to judge these relationships. Three lines of reception connect that ancient inquiry with present practice.

The triad of firmitas, utilitas and venustas continues to offer a concise framework for discussing durability, use and beauty. In the twentieth century, Le Corbusier's Modulor developed a modern system of measure around the human body. It can be studied as a reinterpretation of the anthropometric tradition, while its aims and proportional rules remain distinct from those of Vitruvius.

Symmetria, understood as the commensurability of the parts and the whole through a module, also invites comparison with design governed by relationships and rules. Parametric modeling makes such relationships explicit; Building Information Modeling coordinates information about design, construction and maintenance. These are contemporary analogies proposed by the author. They do not establish a direct technical descent from the ancient treatise.

The discussions of site, orientation, healthy air, materials and water in Books I, VI and VIII likewise remain useful interlocutors for environmental design. Ancient explanations must be assessed within their own scientific and social setting. Reading firmitas today as durability and responsible use of resources extends the historical concept to a modern ethical concern; it does not attribute a present-day environmental agenda to Vitruvius.

His continuing relevance is therefore best tested through informed comparison. The architect can learn from the relation between practical experience and reasoned explanation while examining the limits of both the ancient evidence and its later interpretations. That critical dialogue preserves the vitality of the canon without turning it into a timeless rulebook.

BIBLIOGRAPHY

Recent Scholarship (2020–2026)

Rowland, Ingrid D., and Sinclair W. Bell, eds. *Brill's Companion to the Reception of Vitruvius*. Brill's Companions to Classical Reception 27. Leiden: Brill, 2024.

Bianco, Lino. "Architecture, Engineering and Building Science: The Contemporary Relevance of Vitruvius's De Architectura." *Sustainability* 15, no. 5 (2023): 4150. https://doi.org/10.3390/su15054150.

Selim, Haitham Sadek, Mohammed Salah Mayhoub, and Abdullah Abuzaid. "Reinterpreting the Vitruvian Model in Contemporary Architectural Education: Integrating Empirical Insights from Five Schools of Architecture." *Frontiers in Education* 10 (2025): 1528083. https://doi.org/10.3389/feduc.2025.1528083.

Reference Editions and Studies

Coarelli, Filippo. Rome and Environs: An Archaeological Guide. Berkeley: University of California Press, 2007.

Perrault, Claude, trans. Les dix livres d'architecture de Vitruve, corrigez et traduits nouvellement en François, avec des notes et des figures. Paris: Jean-Baptiste Coignard, 1673. Revised edition, 1684.

Perrault, Claude. Abrégé des dix livres d'architecture de Vitruve. Paris: Jean-Baptiste Coignard, 1674.

Perrault, Claude. Ordonnance des cinq espèces de colonnes selon la méthode des anciens. Paris: Jean-Baptiste Coignard, 1683.

Choisy, Auguste. *Vitruve*. Paris: Lahure, 1909.

Fleury, Philippe, ed. and trans. *Vitruve: De l'architecture, livre I*. Collection des Universités de France (Budé). Paris: Les Belles Lettres, 1990.

Formisano, Marco. "Reading Dismemberment: Vitruvius, Dinocrates, and the Macrotext." *Arethusa* 49, no. 2 (2016): 145–159.

Gros, Pierre, ed. *Vitruve: De l'architecture*. Editio minor. Paris: Les Belles Lettres, 2015.

Le projet de Vitruve: Objet, destinataires et réception du De architectura. Actes du colloque international de Rome (26–27 mars 1993). Collection de l'École française de Rome 192. Rome: École française de Rome, 1994.

Romano, Elisa. *La capanna e il tempio: Vitruvio o dell'architettura*. Palermo: Sellerio, 1987.

Critical Editions of the Latin Text

Callebat, Louis, et al., eds. *Vitruve: De l'architecture*. 10 vols. Collection des Universités de France (Budé). Paris: Les Belles Lettres, 1969–2009.

Fensterbusch, Curt, ed. and trans. *Vitruv: Zehn Bücher über Architektur*. Darmstadt: Wissenschaftliche Buchgesellschaft, 1964.

Fleury, Philippe, ed. and trans. *Vitruve: De l'architecture, livre X*. Budé. Paris: Les Belles Lettres, 1986.

Granger, Frank, ed. and trans. *Vitruvius: On Architecture*. 2 vols. Loeb Classical Library. Cambridge, MA: Harvard University Press, 1931–1934.

Gros, Pierre, ed. *Vitruvio: De architectura*. Translated by Antonio Corso and Elisa Romano. 2 vols. Turin: Einaudi, 1997.

Krohn, Fritz, ed. *Vitruvii De architectura libri decem*. Leipzig: Teubner, 1912.

Rose, Valentin, ed. *Vitruvii De architectura libri decem*. 2nd ed. Leipzig: Teubner, 1899.

Rose, Valentin, and Hermann Müller-Strübing, eds. *Vitruvii De architectura libri decem*. Leipzig: Teubner, 1867.

Saliou, Catherine, ed. and trans. *Vitruve: De l'architecture, livre V*. Collection des Universités de France (Budé). Paris: Les Belles Lettres, 2009.

Soubiran, Jean, ed. and trans. *Vitruve: De l'architecture, livre IX*. Budé. Paris: Les Belles Lettres, 1969.

Translations

Morgan, Morris Hicky, trans. *Vitruvius: The Ten Books on Architecture*. Cambridge, MA: Harvard University Press, 1914.

Oliver Domingo, José Luis, trans. *Vitruvio: Los diez libros de arquitectura*. Madrid: Alianza Editorial, 1995.

Ortiz y Sanz, José, trans. *Los diez libros de architectura de M. Vitruvio Polión*. Madrid: Imprenta Real, 1787.

Rowland, Ingrid D., trans., and Thomas Noble Howe, ed. *Vitruvius: Ten Books on Architecture*. Cambridge: Cambridge University Press, 1999.

Schofield, Richard, trans. *Vitruvius: On Architecture*. London: Penguin Classics, 2009.

Secondary Literature

Callebat, Louis, and Philippe Fleury, eds. *Dictionnaire des termes techniques du De architectura de Vitruve*. Hildesheim: Olms-Weidmann, 1995.

Gros, Pierre. *Vitruve et la tradition des traités d'architecture: Fabrica et ratiocinatio*. Rome: École française de Rome, 2006.

Haselberger, Lothar, et al. *Mapping Augustan Rome*. Journal of Roman Archaeology Supplementary Series 50. Portsmouth, RI: Journal of Roman Archaeology, 2002.

Knell, Heiner. *Vitruvs Architekturtheorie: Versuch einer Interpretation*. Darmstadt: Wissenschaftliche Buchgesellschaft, 1985.

McEwen, Indra Kagis. *Vitruvius: Writing the Body of Architecture*. Cambridge, MA: MIT Press, 2003.

Oksanish, John. Vitruvian Man: Rome under Construction. New York: Oxford University Press, 2019. https://doi.org/10.1093/oso/9780190696986.001.0001.

Pellati, Francesco. *Vitrubio: El gran arquitecto de la antigüedad greco-romana*. Buenos Aires: Ediciones Clot, 1944.

Reinhold, Meyer. *Marcus Agrippa: A Biography*. New York: American Academy in Rome, 1933.

Reynolds, L. D., ed. *Texts and Transmission: A Survey of the Latin Classics*. Oxford: Clarendon Press, 1983.

Rowland, Ingrid D. *The Culture of the High Renaissance: Ancients and Moderns in Sixteenth-Century Rome*. Cambridge: Cambridge University Press, 1998.

Schofield, P. H. *The Theory of Proportion in Architecture*. Cambridge: Cambridge University Press, 1958.

Tatarkiewicz, Władysław. *History of Aesthetics*. Vol. 1, *Ancient Aesthetics*. Madrid: Akal, 2000.

Zanker, Paul. *The Power of Images in the Age of Augustus*. Ann Arbor: University of Michigan Press, 1988.

Digital Sources

British Library. Harley MS 2767, *Vitruvius: De architectura*. Ca. 800 CE. https://www.bl.uk/manuscripts/FullDisplay.aspx?ref=Harley_MS_2767.

Centre d'Études Supérieures de la Renaissance (Tours). *Architectura: Les textes fondateurs de l'architecture*. http://architectura.cesr.univ-tours.fr.

Perseus Digital Library. *Vitruvius, De architectura (Latin text)*. http://www.perseus.tufts.edu.

Project Gutenberg. Morgan, Morris Hicky, trans. *The Ten Books on Architecture* (1914). https://www.gutenberg.org/ebooks/20239.

Critical and reasoned survey of the principal editions and studies

This survey complements the foregoing list by setting out, for the editions, translations and studies of greatest weight, the methodological contribution, the interpretive current and the impact of each on the reconstruction of the Vitruvian context.

1. Editions, fundamental translations and textual apparatus

Granger, Frank, ed. and trans. *Vitruvius: On Architecture.* 2 vols. Loeb Classical Library. Cambridge, MA: Harvard University Press, 1931–34.

Critical assessment. The reference edition in the Anglophone world for the twentieth century. Its principal merit is that Granger was among the first to confront the Harleianus 2767 (H) systematically, restoring to the text a more rustic flavor, closer to the technical Latin of the late Republic, and moving away from the idealising classicist corrections that the humanists of the Renaissance had introduced into the vulgate tradition.

Morgan, Morris Hicky, trans. *Vitruvius: The Ten Books on Architecture.* With illustrations and notes by Albert A. Howard. Cambridge, MA: Harvard University Press, 1914.

Critical assessment. A pioneering and monumental work of early-twentieth-century American philology. Although the translation tends at times to an excessive architectural literalism, its notes and analytical indexes laid the foundations for the study of Vitruvian *utilitas*, showing that many obscure passages acquire perfect sense when checked empirically against the surviving remains of Roman civil engineering.

Rowland, Ingrid D., trans., and Thomas Noble Howe, ed. *Vitruvius: Ten Books on Architecture.* Cambridge: Cambridge University Press, 1999.

Critical assessment. The most influential modern English translation and commentary. Rowland cleanses the text of nineteenth-century anachronisms, offering a fluent prose that reflects both the technical pragmatism and the philosophical aspirations of the author. The accompanying visual and technical commentary by T. N. Howe is indispensable for deciphering the Vitruvian *dispositio* (plans and elevations) in the light of Augustan archaeology.

Saliou, Catherine, ed. and trans. *Vitruve: De l'architecture, livre V.* Collection des Universités de France (Budé). Paris: Les Belles Lettres, 2009.

Critical assessment. Part of the French school's monumental enterprise of editing Vitruvius critically book by book. Saliou's work on Book V (public buildings: fora, basilicas, theaters and baths) is exemplary, combining a fine juridical and historical exegesis with a deep knowledge of the urban topography of northern Italy and the provinces.

2. Historiographical, philological and contextual studies

Gros, Pierre. *Vitruve et la tradition des traités d'architecture: Fabrica et ratiocinatio.* Rome: École française de Rome, 2006.

Critical assessment. Pierre Gros is, without dispute, the foremost contemporary authority on Vitruvian studies. His method revolutionised the field by showing that Vitruvius was not a mere secondary compiler of lost Hellenistic treatises but a skilful ideologue who codified the monumental language of Roman

classicism in the service of the Augustan political renewal. Gros unravels masterfully the conceptual tension between manual practice (*fabrica*) and theoretical and rhetorical foundation (*ratiocinatio*).

Haselberger, Lothar, et al. *Mapping Augustan Rome.* Journal of Roman Archaeology Supplementary Series 50. Portsmouth, RI: Journal of Roman Archaeology, 2002.

Critical assessment. Haselberger's studies are fundamental for confronting the text of Vitruvius with the archaeological and urbanistic reality of Augustan Rome. He demonstrates geometrically how the workshops and the construction drawings of the period — many of them incised directly into the rock of the quarries or onto the slabs of the temples — operated under the strict modular system of proportions that Vitruvius describes theoretically in Books III and IV.

McEwen, Indra Kagis. *Vitruvius: Writing the Body of Architecture.* Cambridge, MA: MIT Press, 2003.

Critical assessment. One of the most original hermeneutic turns of recent decades. McEwen proposes a deeply contextual and political reading: to write about architecture in the age of Augustus was to 'build the body' of the Roman Empire itself. Through an analysis that crosses Stoicism, cosmology and the political theory of the late Republic, she shows that the Vitruvian proportionality of the human body inscribed within circle and square is not a mere geometric conceit but a metaphor of the order and centralization that the Principate imposed.

Archē, Archō and Architectural Etymology

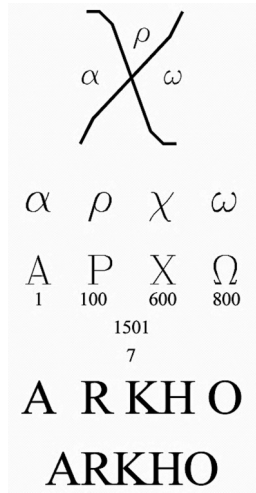


Figure 19. The author's modern isopsephic proposal for APXΩ (archō): 1 + 100 + 600 + 800 = 1501, whose digital root is 7. Diagram supplied for this edition. The calculation concerns APXΩ, not ἀρχή, and is not evidence for an ancient architectural doctrine.

Greek terminology and the author's symbolic comparison

The Greek ἀρχιτέκτων (architekton) combines ἀρχι- (archi-, "chief" or "master") with τέκτων (tekton, "craftsman" or "builder"). It denotes a master builder. The prefix belongs to the word family of ἀρχή (archē, "beginning" or "authority") and ἄρχω (archō, "to begin" or "to rule"). In technical practice, the architect directed and coordinated building work; the title alone does not establish a priestly function. The numerical proposal in Figure 19 concerns APXΩ and is the author's modern interpretation, separate from the linguistic derivation.

The geometry of the plane and the organization of sacred space

planimetric configuration of temples in Pharaonic Egypt — exemplified by the complexes of Luxor, Karnak, and Edfu — responds to criteria of astronomical and topographical precision. The segmentation of space by axial and processional axes allowed for the systematic observation of solstices and equinoxes, fundamental for the civil and agricultural calendar. The structure of the temple, divided between areas of restricted access (priestly cella) and public spaces, was based on a logic of [strictly] functional spatial segregation.

It is important to note that the use of complex geometries, such as the intersection of right triangles to determine the layout on the ground, responds to the needs of architectural layout to guarantee the symmetry and stability of

the structures. Although the plan arrangement may generate crossed configurations (in the shape of an "X"), these correspond to the intersection of orthogonal and diagonal axes, standard tools [in] the surveying and design techniques of Antiquity, lacking any supposed intention of emulating written or dogmatic iconography.

The architect as *artifex*: Evolution of professional titles.

The designation of architects in ancient Egypt, as in the case of Imhotep — architect of the Step Pyramid of Saqqara — is linked to technical mastery in the manipulation of materials. The epithet " potter" or similar titles should not be interpreted under demiurgic categories, but rather as a technical metaphor for the work of molding and construction. The allusion to the "potter's wheel" is an analogy that describes the builder's skill in transforming raw materials (stone or clay) into functional and structured volumes, a technique reflected in both pottery and monumental architecture. ⁴

Paleographic considerations

Regarding the evolution of writing, the Greek letter *rho* (ρ) does indeed derive from the Phoenician phoneme *resh* ( ), whose original pictography represented a human head. Any subsequent link between this letter, the Egyptian logogram of the mouth, or the cult of the god Ra constitutes a symbolic interpretation unrelated to the history of writing. Conventional philology establishes the evolution of signs through processes of phonetic abstraction and cultural adaptation, unrelated to mystical correlations with solar [deities].

Critical Apparatus

1. Etymology of architéktōn: Cf. Chantraine, P. Dictionnaire étymologique de la langue grecque. The root arkhé establishes the hierarchy of the tektōn (carpenter or builder). Use in religious contexts does not necessarily imply priestly status, but rather that the architect was an official serving the administration of the temple, 1968.

2. Astronomical planning: For a technical study on the orientation of Egyptian temples, see Belmonte, J. A., and Shaltout, M. In Search of Cosmic Order: Selected Essays on Egyptian Archaeoastronomy. The functionality of the processional axes responds to the need to align the structure with verifiable astronomical phenomena, 2009.

3. Layout and geometry: Layout techniques on the ground, based on elementary Euclidean geometry, are analyzed in Clarke, S., and Engelbach, R. Ancient Egyptian Construction and Architecture. The resulting "X" shape from intersecting axes is a byproduct of laying out perpendicular lines and 45-degree angles using ropes (twelve-knot rope), 1990.

4. The figure of Imhotep: Wildung, D. Egyptian Saints: Deification in Pharaonic Egypt. The title of Imhotep must be understood within the framework of the Egyptian state bureaucracy, where the technical expertise of the architect was valued as expert and professional knowledge, not as a mystical initiation, 1977.

5. Paleography: Driver, GR Semitic Writing: From Pictograph to Alphabet. The transformation of characters from Phoenician to Greek is a documented process of phonetic transfer. Any association with hermetic meanings lacks support in epigraphic or historical evidence, 1976.

1. *Arkhé* (ἀρχή) and *arkhō* (ἄρχω)

The Greek term arkhé ***(ἀρχή)*** comes from the verb ***arkhō*** (ἄρχω), which means "to begin", "to govern", "to lead" or "to have primacy ".

- **Meaning:** In Greek thought, *arkhé* denotes both the **temporal principle** (origin, source from which something emanates) and the **guiding principle** (authority, power, command).
- **Derivatives:** From this root come all the terms that use the suffix *-archy (*monarchy, hierarchy, anarchy) and the prefix *archi-* (archipelago, archangel, architect).
- **Architect:** *As noted earlier, architéktōn combines arkhé* (authority / *direction*) *with* téktōn *(*carpenter */ builder).* Therefore, an architect is, etymologically, the "chief of the builders" or the "director of the work," someone who exercises *arkhé (direction*) over *téktōn* (execution*).*

2. The origin of the word “arch”

Unlike *arkhé*, the word "arch" does not come from Greek, but from the Latin *arcus*.

- **Etymology:** *Arcus* derives from an Indo-European root (*arkw-*) meaning "to bend" or "to curve". Its original meaning is that of a curved object, whether a weapon (bow and arrow) or an architectural structure.

- **Fundamental difference:** While *arkhé* implies a notion of hierarchy, command, or abstract beginning, *arcus* **refers strictly to a geometric or physical** *form*. **In Latin, arcus** bears no *semantic* or etymological relation to arché (*which* in Latin was retained as a loanword or *translated* as *principium* or *initium*).

alphabetic symbolism perspective, the author proposes that the grammatically analyzed logograph had uses as a fractional symbol in written sentences. This is the author's hermeneutic proposal.

These ideas predate the appearance of the first " Chrismons " associated with Christianity in the Romanesque period, or the " labarum, " the Roman standard used by Constantine, replacing " the eagle of Jupiter " with the " monogram of Christ " or " Chrismon, " a logo or symbol repeated in all churches or sacred buildings of the Romanesque period and later. In Plato 's Timaeus, it is explained that the two bands that form the " soul of the world " (anima mundi) intersect like the letter " Chi. " As we can see, the symbolic genesis of the anagram " Arkhé " predates Christianity.[168]

The Greek term ἀρχή (arkhé, "principle," "foundation," "origin") is one of the fundamental concepts of pre-Socratic philosophy. Together with τέκτων (téktōn, "craftsman," "builder"), it forms the root of the word ἀρχιτέκτων (arkhitéktōn, "architect").

Etymological and functional analysis: From the arkhé *root* to *the* symbolic construction

1. Etymological considerations about the root *arkh-*

It is necessary to clarify the etymology of the aforementioned lexical family. While terms such as *architecture*, *archon*, and *archaic* do indeed derive from the Greek noun ***arkhé*** (ἀρχή) —whose semantics encompass "origin," "principle," and "command" —, not all of the mentioned words share this root.

- **Divergent roots:** Terms such as *arca* (from the Latin arca, "chest"), *arcada* (from the Latin arcus, "arch"), or arcano (from the Latin arcanus, "secret", from *arcere*, "to close/contain") have distinct Latin genealogies. The

168Therefore, it is important to emphasize that: this world is, in fact, a living being endowed with a soul and intelligence, a unique and tangible entity that contains, in turn, all living beings in the universe, which by their very nature are all interconnected. Plato, *Timaeus* 29, 30

association of all these terms under a single root of "first cause" constitutes a semantic construction not supported by historical Indo-European linguistics.

2. Evolution of time computation

The development of calendars in ancient societies responded to a need for administrative and agricultural organization. The recording of lunar phases (*lunae cursus*) was, in effect, the primary method by which various civilizations, including the Roman, structured their initial time cycles, a process that preceded the implementation of complex solar calendars.

3. The cult of Janus (Ianus) and the architecture of transit [hermeneutic reading][169]

Janus's association with architectural passageways and the management of time is based on his role as *deus initiorum* (god of beginnings). The word *Ianus* is etymologically related to *ianua* (door), which justifies his presence in the *iani*, or covered passageways, and monumental arches of the Roman world, such as the one located in the Forum Boarium.

- **Ritual function:** According to classical sources such as Ovid (*Fasti* I, 117–120) and Cicero (*De Natura Deorum* II, 67), the invocation of Janus at the beginning of any rite — *the praefatio* — does not correspond to a static hierarchy, but rather to his functional nature as a mediator in every process of transition (from the profane to the sacred, from the old year to the new). His identification with light and astronomical cycles underscores his role as a regulator of temporality.
- **The Trinity of Names:** The question of Janus's names — his priestly character, his identification as *Quirinus* (frequently associated with the Roman state and civil power), and a supposed arcane name — is part of the theological speculation on tripartite *theology*. While the figure of Janus was fundamental in the most archaic stratum of Italic and Etruscan religion, the existence of a secret name (*nomen sacrum) is a common hypothesis in the study of* mystery religions, although difficult to validate through official epigraphy.

169**Janus (Latin Ianus) is the Roman god of passages, doors and beginnings, represented with two faces. The month Ianuarius, from which English January and Spanish enero derive, was dedicated to him. He was invoked at the beginning of undertakings, at the start of the year and in rites associated with the opening and closing of war. He has no exactly corresponding Greek equivalent.**

on interpretive methodology

From the perspective of paleography and the history of science, such associations lack documentary evidence, since the evolution of graphemes responded to processes of phonetic simplification, and the value of π is an independently developed mathematical concept.

Critical Apparatus

- On etymology: Chantraine, P. Dictionnaire étymologique de la langue grecque. (For the clear distinction between arkhé and the Latin derivatives of arcus), 1968.
- On Roman religion: Dumézil, G. The archaic Roman religion. (Exhaustive analysis of the archaic triad and the role of Janus as guardian of the transitions), 1974.
- Regarding the calendar: Rüpke, J. The Roman Calendar from Numa to Constantine. (Documentation on how lunar observation led to the structuring of the Roman civil calendar), 2011.
- Methodology: Hermeneutic interpretation must be distinguished from historical reconstruction. While the former seeks latent meanings through analogy, the latter is limited to verifiable textual and archaeological evidence.

Janus and dactylonomy: a hermeneutic reading

In the heart of the Forum Boarium, the Temple of Janus housed a statuary whose gestural configuration transcended mere ornamentation. The deity's hands were positioned according to the system of **dactylonomy,** configured to represent the number 355 **(**the duration of the Roman lunar year), symbolically adapting to the **365** - day cycle after the Julian reform. This codification was not accidental: it symbolized Janus's absolute dominion over time and his nature **as** absolute *initium*.

This capacity of the hand to articulate complex theological concepts through coded gestures was a central component of Greco-Roman religiosity. A key testimony to this communicative power is found in Apuleius's *The Golden Ass. In the* description of the procession of Isis, the author recounts how a priest, carrying the sacred attributes, addresses the crowd and performs a specific gesture that was not a simple blessing, but a visual representation of secret knowledge — an initiatory teaching inaccessible to the uninitiated —

demonstrating that gesture functioned as an encrypted code that protected and transmitted the mysteries of the [divine].

Janus, like those initiated into mystery cults, presides over the abstract principles of the cosmos. As the "guardian of the gates," he maintains mediation with the divine pantheon, which is why he must be invoked first in every rite, thus establishing himself as the indispensable regent of human beginnings, historical eras, and [financial] ventures.

Critical Apparatus and Footnotes

1. **On fingerprinting: Pliny** the Elder (*Natural History*, XXXIV, 33) explicitly states that the statue of Janus in the Forum had its fingers positioned in such a way as to indicate the number CCCLV, reflecting the lunar year. Modern historiography has interpreted this as a "calendar statue," where the hand functions as a mechanical computing instrument that positions the deity as the "administrator" of civil time.

2. **The Gesture in Apuleius:** In *Metamorphoses (XI, 17),* Apuleius describes the Isiah procession where the priest, in presenting the sacred objects, performs a gesture (*adinstar*) that encapsulates an arcane doctrine. The use of the term "secret knowledge" (or *arcanum*) in this context underscores that, in antiquity, the manual gesture could function as a hermeneutical *signum*; that is, a form of communication that substituted for the forbidden word or one incapable of explaining the magnitude of the sacred. This passage reinforces the idea that the form of the hands in divine statuary was not only numerical but also carried a deep and hidden semantics.

3. **Primacy in Invocation: The custom** of invoking Janus first is based on the logic of the "door" (*ianua*). Ovid (*Fasti*, I, 171–175) confirms that Janus is the obligatory mediator, since "everything you see, you open or close. " This function as intermediary justifies his privileged position both in the calendar (giving his name to Ianuarius*)* and in the gestural language of the temples, where the god's hand "opens" time before the eyes of men.

Critical Apparatus and Footnotes

1. **On Dactylonomy and Numerical Symbolism:** The use of hands to represent complex numbers was a common practice in antiquity. Pliny the Elder

(*Natural History*, XXXIV, 33) describes how the statue of Janus in his temple in the Forum presented its fingers in such a way as to indicate the number CCCLV (355), reflecting the lunar year. Later, with the evolution of the calendar, the symbolic interpretation of this gesture was adjusted to the 365 days of the solar cycle, emphasizing its role as a regulator of the civil and liturgical calendar.

2. **The dominion of the cosmos:** Macrobius, in his *Saturnalia* (I, 9), details the nature of Janus as a mediating principle between the divine and human worlds. As the "guardian of the gates" and the one who controls access to the other gods, his statue is not only an effigy, but a representation of the temporal and spatial architecture of the universe.

3. **Primacy in Invocation: The** custom of invoking Janus first is based on the concept of *prioritas*. Ovid, in his *Fasti* (I, 171–175), explicitly quotes the god's response: "Whatever you see me do, whether opening or closing, you do it all **yourself**. " This justifies the ritual of *praefatio*, where the sacrificer must mention Janus before any other deity to ensure the efficacy of the rite.

Critical Apparatus

1. **On manual computation (dactylonomy):** Pliny the Elder documents in his *Naturalis Historia* (XXXIV, 33) that the statue of Janus in his temple in the Forum had its fingers arranged to indicate the number 355. Modern exegesis, such as that proposed by L. Richardson Jr. in *A New Topographical Dictionary of Ancient Rome* (1992), interprets this gesture as a calendrical instrument *that* positions Janus as the regulator of the temporal *order*, linking the architecture of the temple with the administration of Roman civil time.

2. **Gesture as an *Arcanum* in Apuleius:** In *Metamorphoses* (XI, 17), Apuleius describes the priest performing a gesture that transcends ordinary communicative function. This practice falls under what scholars of mystery cults call "sacred gestures." As F. Graf argues in *Magic in the Ancient World* (1997), gesture in the rites of Isis acts as a "silent codification " that distinguishes the initiate from the profane, transforming the hand into a tool of theological exegesis.

3. **Ritual Primacy and Mediation: The** character of Janus as *Deus initiorum* is analyzed by Ovid in Fasti *(*I, 171–175). The logic of mediation — the idea that

all access to the divine sphere requires the prior opening by Janus — is a constant in Roman theology. As G. Dumézil argues in La *religión romana arcaica* (1974), Janus is not a god with specific attributes over natural elements, but rather the deity who controls the very possibility of action and movement, both in private life and in the financial enterprises of the State.

This edition stems from an extended study of the symbols, archetypes, and technical traditions linked to architecture and the art of building in classical antiquity. Through the figure of Marcus Vitruvius Pollio and his treatise De architectura, an attempt has been made to offer a comprehensive approach that combines historical and philological analysis with a hermeneutical reading of the symbolic dimensions present in the Greco -Roman architectural tradition.

Vitruvius is not only the only architectural theorist whose complete works have survived from antiquity, but he also embodies a comprehensive conception of technical knowledge in which *fabricatio* and *ratiocinatio * — practice and theoretical reflection — are inextricably linked. His treatise, structured in ten books, constitutes a true encyclopedic corpus that reflects both the technical knowledge of his time and a vision of the architect as an intellectual versed in the liberal arts.

The influence of De architectura far transcends its value as a construction manual. Its rediscovery and dissemination from the 15th century onwards decisively contributed to shaping the architectural thought of the Renaissance and the Modern Age. From Leon Battista Alberti to Andrea Palladio and Le Corbusier, by way of Leonardo da Vinci, the Vitruvian tradition has served as a guiding thread linking Antiquity with modernity.

I arranged its distribution so that whoever is looking for a specific topic does not have to search for it in different parts, but rather has in each of the volumes a complete explanation of the different styles or genres, all in a single set.

L. V-Preface

I will now discuss the distribution the author proposes for the content of the ten volumes. My reasoning will be aided by the image the "Ten Books" would have taken on a shelf in a Roman library. For this purpose, I will use the papyri recovered from Herculaneum, which date from the 1st century AD.

Vitruvius mentions the Greek philosopher several times in his texts, acknowledges great admiration for his wisdom, and in the preface to Book V, in the center of his text, he explains his knowledge of the Pythagorean postulates with these words:

“Pythagoras and the Pythagoreans also held this opinion. They thought it proper to set down their theories and precepts in volumes framed on a cubic principle (cubicis rationibus): they fixed the cube at 216 units, and laid down that no single precept should exceed three verses.”

L. V-Preface.

No less, when I had noticed that the city was busy with public and private affairs, I decided to write briefly, so that readers might grasp them quickly in the brief span of their leisure.

Even Pythagoras and those who followed his school, for philosophical reasons, decided to write down the precepts in volumes, and they established a code of 216 verses, and they thought that no more than three of them should be included in one collection.

Vitruvius Pollio. On Architecture. F. Krohn. Lipsiae: Teubner, 1912

And Pythagoras, and those who followed his sect, also decided to write the precepts in volumes according to the cubic ratio (cubicis rationibus), and established that the cube consisted of 216 verses, and thought that no more than three of them should be written in a single inscription.

Vitruvius Pollio. De architectura.
F. Krohn. Leipzig: Teubner, 1912

The text "Vitruvius De architectura," known as Vitruvius's Ten Books on Architecture, undoubtedly held authority on classical science at the time the Book of Revelation was written. Its references were equally valid for both the Roman and Hebrew worlds, since its sources were classical in nature.

In the first chapter of the third book, Vitruvius writes the following:

"Mathematicians affirmed that the perfect number is the number six, since it has divisions that add up to six in the following way: the sixth part is one; the third part is two, which is half of six; two thirds make up the number four, called in Greek dimoeron; five parts of the number six, known as pentemoeron,

result in the number five; and the perfect and final number, ephectum, is formed by adding six plus one third part, called terciarium in Latin and epiritos in Greek.

Adding half of six to the number six gives us the number nine, which is a sesquilateral number, hemiolios in Greek; adding two-thirds to the number six gives us ten, epipidimoeros in Greek; the number eleven is the result of adding five to the number six, that is, a quintary, epipemptos in Greek; the number twelve is obtained by adding six twice, the elementary number called diplasios. Likewise, the foot is one-sixth of a man's height, or, in other words, adding six times a foot gives us the height of the body. Therefore, it is concluded that the number six is considered perfect, coinciding with the belief in Greece that this number was the emblem of physical nature, as the generator of the cosmos."

Vitruvius mentions that in Greece the number six was considered the emblem of physical nature and the generator of the cosmos. In this chapter, he recovers the Chaldean tradition which, since antiquity, attributed to the number six the representation of creation, considering it a perfect number. The Chaldeans classified their deities according to the number six, assigning the number 6 to minor gods and to wise men or teachers. The principal god, Anu, was represented by the number 60.

Vitruvius mentions in his Book V that Pythagoras and the Pythagoreans wrote their theories and rules in volumes of cubic structure, called "cubicis rationibus", representing the cube as a set of 216 verses, where each rule did not exceed three verses.

In the prologue to Book V, Vitruvius explicitly refers to the "cubic ratio " and the number 216 as a structural support of Pythagorean knowledge. This Vitruvian passage has been cited and commented on by various scholars as an example of the penetration of Pythagoreanism into Roman architectural culture during the Augustan period. See Rowland and Howe (1999), *66–67*, for a discussion of the passage.

In a hermeneutical reading—which the author presents as a personal hypothesis and not as established historical fact—it has been suggested that the "cubic ratio" that Vitruvius mentions in the prologue to Book V could be read as a symbolic organizing principle of the work. It is important to emphasize that

this interpretation lacks documentary support and that critics do not consider it a fact: it is offered solely as commentary.

Vitruvius writes about the parts that make up the discipline of architecture:

"There are three parts to Architecture: Building, Gnomonics, and the construction of machines (machinatio). In turn, construction is divided into two parts: one part deals with the arrangement of walls and common works in public places; the other part deals with the development of private buildings. "

Public buildings have three possible objectives: protection, worship, and advantageous location:

The protection refers to the structure of walls, towers and gates, with the purpose of repelling enemy attacks at any time.

The cult refers to the location of the temples of the immortal gods and the sacred sanctuaries.

The advantageous situation consists of the arrangement of common places intended for public use, such as ports, forums, porticoes, public baths, theaters, promenades and similar constructions, which are located in public places, serving the same purpose of use.

Lib. III

In a hermeneutical reading proposed by the author—which should be understood as a personal interpretation, not as historical fact—one could attempt to draw a correspondence between the arrangement of the ten books and the figure of the Tetractys. It is worth emphasizing that there is no ancient evidence to support the claim that Vitruvius organized his work in this way.

BUILDING - GNOMONICS - MECHANICS

EDIFICATION

First Line

Books I to IV: The basis of architecture set out in its entirety in Book I and developed in the first four.

This first line, composed of the first four books, is presented in the text as a related set.

In the third and fourth books I will explain the rules for the construction of temples as well as for establishing their symmetry of the different surfaces, since it seemed more appropriate to me to deal in the second book with the material resources that must be available for the buildings, studying their characteristics and their advantages.

Lib. VII

LIBER I

Architectural training and basic architectural concepts; The founding of cities.

City shape:

" Thus, O Emperor, I have already explained and set forth to you, in the first book, the conditions of architecture, the qualities and the practical teachings proper to the architect that he himself must enhance.

As it was important and necessary, I explained with reasoning the whole subject of the founding of cities, the way to select the most favorable places, I developed the question of the winds, their number and the origin of each of them, showing them in some graphs; I finished the first book, showing the location of squares and neighborhoods, in order to improve their urban distribution within the walls, their properties and their natural qualities for construction. "

Liber III, Praefatio

LIBER II

Construction materials

Building materials as " atoms " of architecture

BOOK III - BOOK IV

Temple construction

The selected location of the temples and their detailed construction.

For the author, the first four books represent the foundation of all architecture.

Books V to VII: The elements that complete the city formed by the public and private buildings.

LIBER V

Public buildings

Public buildings

LIBER VI

Private Buildings

Private buildings.

LIBER VII

Interior design of private buildings; Color science

Regarding the completion of the building

The author concludes in the second line with Building as the first part of Architecture:

"By putting the final period to these seven volumes, I consider the subject of the construction of all kinds of buildings, as well as the most favorable structure they should present, to be concluded."

L. VII-C. XIV

GNOMONICS

Third Line

The ancient Chaldean science of "knowledge and its principles. " The word "gnomonics " originates from the Greek "gnomon," denoting "knowledge" and "inquiry. " This word likely arose due to the complexity of the scientific knowledge required to correctly position the rod of sundials. However, the designation of this science has evolved over time. In the 5th century, the term "sciotereo" appears, meaning "I observe the shadow." Although in the 2nd century, Clement of Alexandria referred to gnomonics as "sciography" in his writings. Later, we find curious names such as "horography " ("writing of clocks") and "photosciateria " ("writing of light ").

LIBER VIII

Water supply

Thales of Miletus, one of the Seven Sages, held that water was the first principle (archē) of all natural things. Water is essential for life.

LIBER IX

Astronomy and watchmaking.

Thales of Miletus, Anaxagoras of Clazomenae, Pythagoras of Samos, Xenophanes of Colophon, and Democritus of Abdera developed theories, within natural

philosophy, about the causes that control nature and about how they produce their effects.

The author connects the content of both books in the text, repeatedly mentioning the sages of Antiquity as possessors of "knowledge." The encyclopedic knowledge of the ancient masters resides in the third line.

"In the first seven books I have dealt with the subject of the construction of buildings; in the eighth, I expounded on the subject of water, and in this ninth book I will deal with gnomonics and its discovery from the rays of the sun in the world and from the shadows projected by the gnomon; I will also explain the proportion in which the shadows are lengthened or diminished."

Liber IX, Praefatio

MECHANICS
LIBER X

Mechanical Engineering

Now, we will analyze the subject of machines and their principles. In the next book, I will address this question, so that this treatise on architecture may be perfectly complete.

L. IX-C. VIII

"All machinery originates in nature, with the revolution of the universe as its teacher and guide." — Vitr. De arch. 10.1.4. The following sentence is lacunose in Krohn's text (1912, 225); the surviving words associate celestial motion with light and the ripening of crops. The broader cosmological reading developed here is the author's interpretation.

L. XC. I

Vitruvius attributes a natural and cosmic origin to mechanics, comparable to celestial mechanics. Therefore, to properly understand his expressions, it is essential to consider machines as products of this origin, as a reflection of the "unceasing movement of the Sun, the Moon, and the five planets." Each book presents content in complete harmony with its corresponding number, adhering to the Pythagorean conception assigned to the

first ten numbers. At the same time, through the relationships between neighboring numbers, each book contains linked content, both to those that share its structural level and to those immediately adjacent.

Book VIII, which deals with water, is related not only to Book IX, which is of the same line, but also to Books V and VI, which deal with public and private buildings that require a supply of drinking water.

Book VII, concerning the finishing of buildings, is related to those of the same line and to Books III and IV, which deal with the construction of temples. At the same time, it is influenced by gnomonics, which allows for the adoption of the best solutions in accordance with the natural philosophy of things.

Let us recall the author's words once more:

PYTHAGORAS. The philosopher of number.

GONZÁLEZ URBANEJA, PEDRO MIGUEL
978-84-96566-58-3

Pythagoras is probably the most famous mathematician, but he is also celebrated in the broader field of cultural history. His figure is one of the most fascinating and interesting in the history of thought. Rationalist and mystic, philosopher and theologian, mathematician and experimenter, man ...

De architectura is a treatise on architecture written by Marcus Vitruvius, probably around 15 BCE

In the first chapter of his initial book, Vitruvius reveals that the architect's wisdom originates in "fabrica" (the practice of the craft) and "ratiocinatio" (intellectual work), thus enabling him to evaluate all other trades. In the Renaissance, this dichotomy inspired architects to break with medieval guild structures and building traditions, introducing a personal separation between practical execution and the theoretical creation of design. This approach was especially evident in figures like Leon Battista Alberti, who devoted himself exclusively to creating plans and models, leaving the actual construction of buildings to experienced project managers.

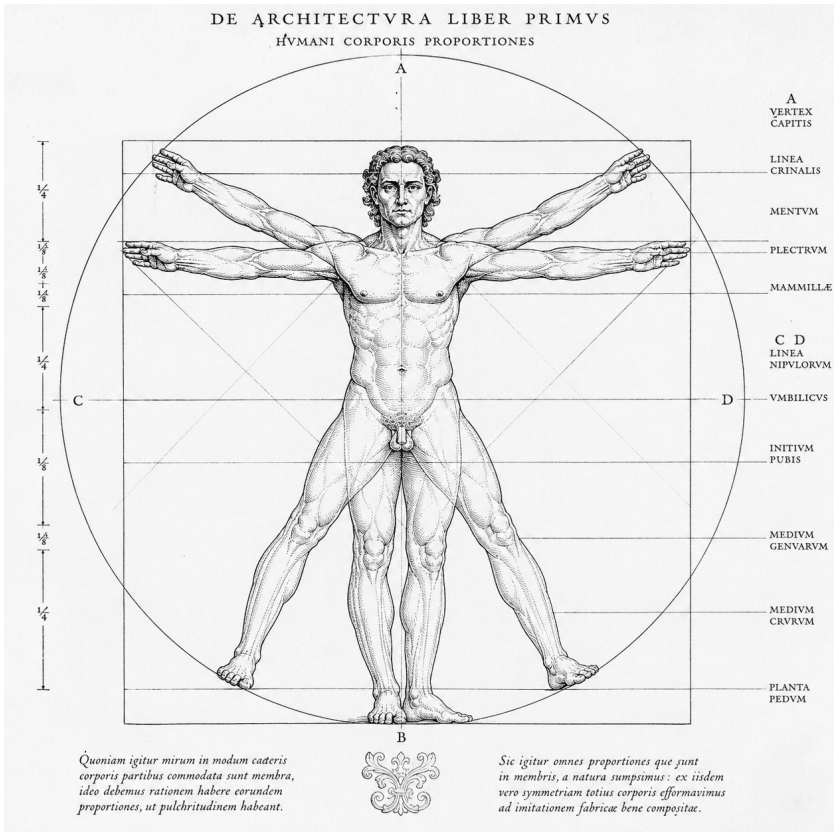


Figure 20. Comparative illustration of the human body within circle and square, from the material supplied for this edition. Textual reference: Vitruvius 3.1.2–3. It is used as an editorial visualization; its lettering is not cited as an ancient textual witness.

Regarding the theoretical training of the architect, Vitruvius advocated education in the liberal arts. In doing so, he transferred the need,

expressed by Cicero, for a complete education for orators (rhetoric) to his own sphere, going back to the ancient Greek tradition of a comprehensive education (ἐγκύκλιος παιδεία, "enkykliospaideia"). This concept is reflected in his work through the term " encyclios disciplina [encyclopedic education; cf. Vitruvius, De architectura 1.1.12]".

Vitruvius identifies ten areas of knowledge that an architect must master for the benefit of his architectural work: 1. Writing, 2. Drawing, 3. Geometry, 4. Arithmetic, 5. History, 6. Philosophy, 7. Music, 8. Medicine, 9. Law, 10. Astronomy. In his work, he addresses, among other topics, the dogmas of Plato and Pythagoras, and explains how Archimedes discovered the principle that bears his name, as well as the results obtained by Eratosthenes and Archytas of Tarentum when measuring the Earth.

The highest temple of architecture

Vitruvius prioritizes the ideal architect over the art of architecture, thus restricting access to the realm of architecture. The architect embodies architecture (a royal compendium of all things, united through art), but is only perfected through a comprehensive training course in various disciplines, which Vitruvius likens to a corpus. This discipline, the encyclios, [170]has evoked the liberal arts for many readers, who imagine that Vitruvius invokes these disciplines to "elevate" architecture or even Vitruvius himself. However, it is also evident that architecture was already perceived as intellectually meticulous.

By establishing a symmetry between his training (multidisciplinary but moderate) and his influence (which extends even to the products of all the other arts), Vitruvius creates a divide that evokes a similar disparity characteristic of the ideal orator in Cicero 's "De Oratore." Vitruvius recreates the ebb and flow of "De Oratore" to place architecture in competition with oratory as the supreme type of civic knowledge. Of particular importance is that both Vitruvius and Cicero question whether their disciplines were genuine "arts," recalling the fundamental objection posed by Socrates against rhetoric in "

170Encyclios is related to Greek ἐγκύκλιος, ‘circular’ or ‘general’, as in the expression ἐγκύκλιος παιδεία for a general education. In the present context it denotes the interconnected course of disciplines relevant to the architect’s formation.

Gorgias." Cicero, in fact, evades these questions by denying the possibility of a Roman ars oratoris and insisting, instead, on the embodiment of oratory.

Vitruvius's architect also becomes a master of signs and representation, distinctly Roman, precisely because he embodies architecture. Ultimately, however, Vitruvius's account differs from Cicero's. While the orator's attention to decorum demonstrated his aptitude as an ambitious leader in the interests of the republican civitas, the architect's training ultimately guarantees that he will serve the princeps faithfully (but not subserviently).

John Oksanish, Vitruvian Man: Rome under Construction (New York: Oxford University Press, 2019).

Collection: Oxford Scholarship Online

Later plans of the Greek house, such as the schematic drawing below, attempt to correlate the domestic spaces named in Vitruvius 6.7. They interpret the organization described in the text rather than record a particular excavated dwelling.

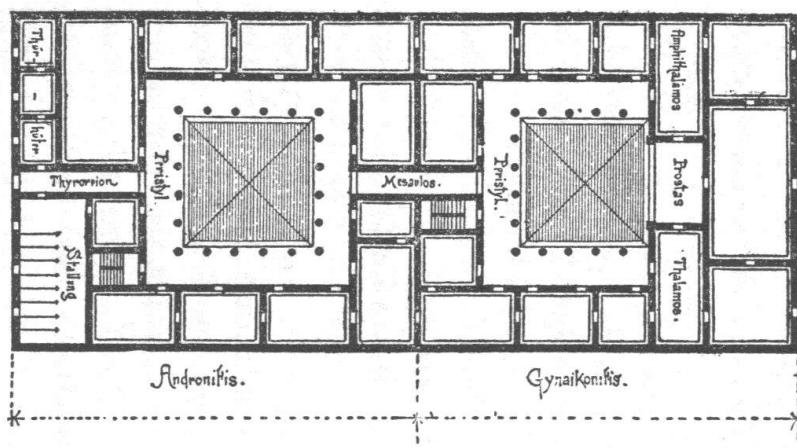


Figure 21. Schematic reconstruction of the Greek house described in Vitruvius 6.7, distinguishing andronitis and gynaikonitis. Reproduction from the illustrative material supplied for this edition. The exact earlier printed source remains unidentified; this is not an ancient plan or an excavated house.

A related question is the relation between bodily measure and architectural design. Vitruvius's account of human proportion in 3.1.2–3 may be summarized as follows:

1. Commensurability as a governing principle

Vitruvius relates the proportional organization of a temple to that of a well-formed human body. The analogy concerns the commensurable relation of parts to the whole, rather than bilateral symmetry alone. He gives the following ratios:

- **The face:** The face, from the chin to the top of the forehead (where the hair grows), should measure **one - tenth** of the man's total height.
- **The hand:** The length of the hand, from the wrist to the tip of the middle finger, is also equal to **one - tenth** of the total height.
- **The head:** From the chin to the crown, it represents **one-eighth** of the total height.
- **The upper chest: The distance from the upper chest to the hairline is one-sixth of the body's height; the distance from the upper chest to the crown is one-quarter.**

2. The circle and the square

Vitruvius postulates that the human body has two inscribed geometric forms that demonstrate its proportional perfection:

- **The square:** If a man stands with his arms extended horizontally, the distance between his fingertips (his wingspan) is equal to his total height. Thus, inscribing the body in a square results in a figure with equal sides.
- **The circle:** If a man lies on his back with his legs and arms outstretched, his navel is the center point of his body. If a circle is drawn by placing a compass on his navel, the circumference will touch the tips of his fingers and toes.

3. The body as a unit of measurement (The module)

Vitruvius insists that the measurements of the human body should be the basis for establishing "modules" in architecture:

- The **foot**: It is equivalent to **one sixth** of the total height of a man.
- The **cubit** (distance from the elbow to the tip of the middle finger): Represents **one-quarter** of the height.

4. The purpose: *Eurythmia*

Vitruvius uses the relations between the parts of the human body as an analogy for the commensurability required in temple design. His account of eurythmia

in 1.2.3 also connects a pleasing appearance with the fitting proportions of the members. A broader reading of these relations as an expression of cosmic order belongs to interpretation and should be distinguished from the measurements stated in 3.1.

Academic note

Vitruvius, De architectura 3.1.1–3, connects bodily proportion with the design of temples. Leonardo's later drawing investigates this account through its own graphic construction and accompanying measurements; it is not a surviving ancient illustration. The comparison must distinguish Vitruvius's words, Leonardo's visual choices and the present author's interpretation.

APPENDIX D · INDEX VERBORUM GRAECORVM

A selective index of Greek technical vocabulary. Page references locate verified occurrences in the text; forms and inflections may also occur elsewhere.

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Appendix E · Index locorum

Index of ancient works and passages cited or discussed in this volume. References identify the canonical book, chapter or section, or the relevant internal discussion; they are not page numbers.

I. Ancient Authors

Aristoxenus
Elementa harmonica (note on the echea, 5.5; Glossarium, s.v. echea)

Cato
De agri cultura (Notice to Book II; note on the villa rustica, 6.6)

Cicero
De natura deorum 2.150.....
De natura deorum 2.119 (Glossarium, s.v. *symmetria*)
De officiis 1.14 (Glossarium, s.v. *distributio*)
De oratore 1.142 (Glossarium, s.v. *dispositio*)
De oratore 1.144 (Glossarium, s.v. architectura)
Orator 70–74 (Glossarium, s.v. *decor*)

Columella
De re rustica (note on the villa rustica, 6.6)

Euripides
Phaethon fr. 771 Nauck.....

Homer
Iliad.....
Odyssey.....

Lucretius
On the nature of things.....

Ovid
Metamorphoses 8.157 – 182.....
Metamorphoses 8.183 – 216.....
Metamorphoses 8.236 – 259.....

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Timaeus 36d.....

Pliny the Elder

Naturalis historia 34 (Glossarium, s.v. *eurythmia*)
Naturalis historia 35.166 (Glossarium, s.v. pulvis Puteolanus; note on pozzolana, 2.6)

Varro

Res rusticae 1.11 (Glossarium, s.v. fundamentum)
Res rusticae (Notice to Book II; note on the villa rustica, 6.6)

II. Vitruvius, On Architecture (internal places)

Internal references to the treatise itself that appear in the study and apparatus, arranged by book, chapter and paragraph.

Book 1, 1.1
Book 1, 1.11
Book 1, 1.12
Book 1, 2.1
Book 1, 2.2
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Book 3, 4.5.....
Book 5, preface 3.....
Book 5, 1.6.....
Book 5, 5.1.....
Book 6, preface 1.....
Book 9, paragraph 9.....

III. Ancient sources in dialogue with the treatise (analytical survey)

This complementary survey lists the principal passages of other ancient authors that interact with the *De architectura* as philological sources, scientific authorities cited by Vitruvius, or contemporary testimonia that illuminate his context. Page references are omitted, since these passages function as external parallels rather than as internal citations.

Pliny the Elder, Naturalis Historia

Index, books XXXV–XXXVI: explicit mention of Vitruvius as a documentary source for the history of art, marbles and building stones.

XXXV.166–172: types of brick and the use of fired earth in traditional architecture, in direct parallel with Vitruvius II.3.

XXXVI.54–56: the working of the marble quarries of Luna (Carrara) under Augustus.

Frontinus, De aquaeductu urbis Romae

I.25: reference to Vitruvius as a pioneering *architectus* in the standardization of pipe sizes and distribution modules (*fistulae*).

I.26: technical comparison between the Vitruvian modular system of plumbing and the later reforms introduced by the engineers of Agrippa.

Cicero

De officiis I.150–151: the moral censure of the mechanical arts and manual trades held unworthy of the senatorial citizen — the background to Vitruvius's effort to dignify his profession.

De oratore I.62: the requirement that the orator master many arts, a passage Vitruvius formally imitates in Book I when describing the encyclopedic culture of the architect.

Ad Quintum fratrem 3.1.1–2: critical remarks on the conduct and budgets of the Hellenistic architects working on the villas of the Republican elite.

Varro, De lingua Latina / Disciplinae / De re rustica

Disciplinae, books VIII–IX (fragments): the encyclopedic structure that included medicine and architecture among the liberal arts — a direct methodological source for Book I of Vitruvius.

De re rustica 1.2.4: advice on farm construction based on the healthiness of the site and the orientation of the winds, in exact correspondence with Vitruvius I.4.

Aristotle

Metaphysics A, 981a–981b: the distinction between the experience (*empeiria*) of the manual craftsman and the knowledge of causes (*technē*) of the master

builder (*architektōn*); the philosophical origin of the *fabrica* / *ratiocinatio* duality.

Politics VII, 1330b–1331a: urbanistic recommendations on the orientation of streets and the walled defense of the ideal city.

[Mechanica] 847a–848a: the principle of the lever and the conversion of circular into rectilinear motion — the conceptual core of Vitruvius, Book X.

Theophrastus, Historia plantarum / De lapidibus

Historia plantarum V.1–5: the botanical classification of building timbers by density, strength and season of felling — a direct source for the analysis of materials in Vitruvius II.9.

De lapidibus 1–5: the nature and properties of stones, colored earths and gypsum.

Euclid, Optica / Elementa

Elementa I, props. 1–47: the elementary plane geometry used by Vitruvius for setting out plans (*ichnographia*), the theorem of Pythagoras and empirical squaring.

Optica, defs. 1–4: the theory of visual rays, the mathematical basis for the optical corrections of columns (*entasis*) and for conical perspective (*scaenographia*) in Vitruvius III.4 and I.2.

Hero of Alexandria, Mechanica / Pneumatica

(Note: although Hero's surviving work dates from the 1st c. AD, it reflects the Alexandrian science that Vitruvius assimilated in the 1st c. BC.)

Mechanica I.1–5: the kinematic theory of gears, pulleys and compound tackle for lifting great weights, identical to the devices described in Vitruvius X.2.

Pneumatica I.42: the description of the water-organ (*hydraulus*), corresponding almost point for point to the complex technical passage of Vitruvius X.8.

Ptolemy, Analemma

(Note: a testimony to the maturity of the sciences that Vitruvius sketches in their early phase.)

Analemma 1–3: the geometric method of projecting the celestial sphere onto a plane for the design of sundials and quadrants, set out in rudimentary form in Vitruvius IX.1–7.

APPENDIX F

Proportions of orders and metrological equivalences

The following tables summarize, for reference purposes, two sets of data scattered throughout the treatise: the canonical proportions of the three orders (according to Books III and IV) and the equivalencies of the Roman units of measurement used by Vitruvius, converted to the metric system. The figures for the orders are expressed in modules (pillars), the module being the lower half-diameter of the shaft, unless otherwise indicated; these are ideal values of the Vitruvian canon, from which the surviving works frequently deviate.

Table 3. *Canonical proportions of the orders, compared across treatises*

Order	Vitruvius (1st century BC)	Vignola (1562)	Palladio (1570)	Le Corbusier
Tuscan	≈ 7 (cf. 4.7)	7	7	—
Doric	≈ 7 (4.3)	8	8 1/2	—
Ionic	8 1/2 – 9 (3.5)	9	9	—
Corinthian	≈ 9 ½ (4.1)	10	9 1/2	—
Compound	(not coded)	10	10	—
Module / Canon	*symmetria* (module = ½ diam.)	systematic module	module	Modulor (1948): body + φ

Table 4. *Proportions of the orders, element by element*

Element	Doric	Ionic	Corinthian
Height of the column (with capital)	14 modules (7 diam.)	17.5 modules (8.5–9 diam.)	20 modules (10 diameter)
Lower diameter of the shaft	2 modules	2 modules	2 modules
Height of the capital	1 module	2/3 of the modulus (≈0.66)	2 modules (1 diameter)
Base height	— (without base, attic optional)	1 module (½ diameter)	1 module (½ diameter)
Height of the entablature	≈ ¼ of the column	≈ 1/5 of the column	≈ 1/5 of the column
Architrave (epistylium)	1 module	½–⅔ of a module	½ of a module

Element	Doric	Ionic	Corinthian
Frieze (zophorus)	1.5 modules (triglyphs)	plain or decorated	plain or decorated
Optimal intercolumniation (eustyle)	—	2¼ diam. (center 3)	2¼ diam. (center 3)
Shaft contraction (contractura)	⅙ of the lower diameter	⅙–⅛ of the diam.	⅛ of the diam.

References: Doric, De architectura 4.3; Ionic, 3.3 and 3.5; Corinthian, 4.1. The Eustilus intercolumnium, attributed to Hermogenes, is developed in 3.3.6-9. Diameter equivalencies are offered in parentheses because they are frequently used in modern literature (Rowland-Howe).

Table 5. *Roman units of measurement and their metric equivalents*

Latin Unit	English	Relationship	Metric equivalence
digitus	finger	1/16 of a foot	≈ 1.85 cm
palmus	palm	4 fingers = ¼ foot	≈ 7.4 cm
pes	foot	16 fingers / 4 palms	≈ 29.6 cm
palmipes	foot and palm	1¼ ft	≈ 37.0 cm
cubitus	cubit	1½ feet / 6 palms	≈ 44.4 cm
gradus	step	2.5 feet	≈ 74.0 cm
passus	pace	5 feet	≈ 1.48 m
decempeda	pole	10 feet	≈ 2.96 m
actus	actus	120 feet	≈ 35.5 m
stadium	stade	625 feet	≈ 185 m
mille passus	mile	5,000 feet / 1,000 paces	≈ 1.48 km

The Roman foot (pes monetalis) is taken to be ≈ 29.6 cm, a standard value for the Augustan period; the equivalencies are approximate and vary slightly according to the region and period. Vitruvius sets forth the system of fractions of the foot and the proportion of the human body as the basis of measurement in De architectura 3.1.5-8.

Based on these units, Vitruvius also derives the " perfect" numbers: ten (perfectus, because of the fingers of the hands) and six (teleios, because of its divisors), the sum of which gives the sixteenths of the foot; cf. 3.1.5-9.

APPENDIX G

Index nominum (Index of proper names)

A selective index of proper names. The references point to discussions in this composition; repeated mentions within indexes are excluded.

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APPENDIX H

Consolidated chronology

The following table brings together in a single sequence the key events relating to Vitruvius's life, the composition and dedication of the treatise, its manuscript transmission, and the principal printed editions. It is offered as the sole chronological reference for the entire volume. The dates from Antiquity are approximate, and where the evidence differs, the dating adopted in the preliminary study is followed (composition between 27 and 23 BCE).

Date	Milestone
c. 80–70 BCE	Probable birth of Marcus Vitruvius Pollio.
c. 58–51 BCE	Service as a military engineer (apparitor) in the service of Julius Caesar, probably in Gaul.
Late first century BCE (date uncertain)	Vitruvius states that he designed and supervised a basilica at Fanum Fortunae (5.1.6–10). The statement is distinguished from modern archaeological identification.
c. 30 BCE	Through Octavia's mediation, he receives a pension (commoda) that allows him to dedicate himself to writing.
27–23 BCE	Composition and dedication to Augustus of the Ten Books of Architecture (De architectura libri decem).
after 15 BCE	Last date he is presumed to be alive; the date of his death is unknown.
1st century AD	Pliny the Elder (Natural History) and Frontinus use and quote the treatise.
4th–5th century AD	Faventino and Paladio summarize and transmit parts of the work.
800–824 CE	Harley MS 2767, the oldest known surviving copy; its precise place of origin is uncertain.
838–842 CE	Carolingian transmission associated with Reichenau; its position in a stemma requires a named critical source and is not a documented provenance of Harley MS 2767.
9th–15th century	Diffusion in more than ninety manuscripts; read by Einhard, Hugh of Saint Victor, and Hildegard of Bingen.
1416	Poggio Bracciolini’s manuscript searches belong to the Renaissance reception of Vitruvius. They should not be conflated with the documented provenance of Harley MS 2767.
c. 1486	Editio princeps de Giovanni Sulpicio da Veroli (Rome).

Date	Milestone
1511	Illustrated edition of Fra Giovanni Giocondo (Venice), the first with figures.
1521	Annotated Italian translation by Cesare Cesariano (Como).
1567	Edited and with commentary by Daniele Barbaro, with illustrations by Palladio (Venice).
1673	Claude Perrault's French translation, Les dix livres d'architecture de Vitruve.
1899	Valentin Rose's critical edition (Teubner, Leipzig), a comparative reference.
1912	Fritz Krohn's critical edition (Teubner, Leipzig), the principal Latin control for this edition.
1969–2009	Publication of the individual Budé volumes by their respective editors, translators and commentators.
1999	Translation and commentary by ID Rowland and TN Howe (Cambridge), modern reference in English.
19 January 2026	The Italian Ministry of Culture announces the identification of the Piazza Andrea Costa remains at Fano as Vitruvius's basilica; investigation continues.
2026	Bilingual Latin-English edition of Diego Kurilo (Sophia Lux Academic Editions).

Table 6. Consolidated chronology of Vitruvius and his text

Note: the dates of the 1st century BC and 1st century AD relative to Vitruvius' biography are the subject of scholarly debate; those given here represent the majority hypothesis. The dates of the printed editions are certain.

APPENDIX I

Testimonia veterum (Ancient Testimonies about Vitruvius)

Antiquity and the early Middle Ages that mention Vitruvius or use his work are gathered. They constitute the documentary basis for reconstructing his biography and the fortune of De architectura, and explain why the treatise, far from being completely forgotten, enjoyed continuous transmission.

Pliny the Elder, Natural History, indexes of books XVI and XXXV. He includes Vitruvius among the sources (auctores) he uses for the chapters on materials and pigments; it is the oldest testimony of the use of the work, barely one or two generations after its composition.

Frontinus, De aquaeductu urbis Romae. The curator aquarum of Rome (c. 97 CE) agrees with Vitruvius in the measurements of the pipes (fistulae) and in the hydraulic doctrine, which proves the technical circulation of the treatise in the field of public administration.

Faventino, De diversis fabricis architectonicae. Compendium from the 3rd-4th century AD that summarizes and transmits large portions of Vitruvius; It is the main late antique link in the tradition.

Palladius, Opus agriculturae. He collects, through Faventinus, Vitruvian prescriptions on rural construction, disseminating them in medieval agronomic literature.

Servius, Commentarii in Vergilii Aeneidem. The grammarian quotes Vitruvius on matters of architecture and religion, a sign of his authority in late antique teaching.

Sidonius Apollinaris, Epistulae IV.3. He mentions Vitruvius as a model of technical knowledge, proof of his prestige in 5th century Gaul.

Cassiodorus, Variae VII.5; Institutiones. He recommends the reading of Vitruvius to the officials in charge of the public works of the Ostrogothic kingdom (6th century), guaranteeing its survival.

Einhard, Epistulae. Charlemagne's biographer uses Vitruvian vocabulary and concepts, reflecting the circulation of the text in the Carolingian Renaissance that produced the Codex Harleianus.

The continuity of these testimonies, from Pliny to the Carolingian era, qualifies the topic of the Renaissance " rediscovery ": Poggio Bracciolini (1416) did not rescue a lost text, but returned to cultured circulation the best of its manuscripts.

APPENDIX J

Loci verificati (Passages checked, book by book)

The following entries bring together selected passages and terms from all ten books. Krohn (1912) is the reference edition for the quotations checked here; Rose, Granger and the relevant Budé volume offer further points of comparison. Bibliographical references identify editions, not newly collated manuscripts. Any statement about a particular witness or substantive variant requires the precise locus and the apparatus of the edition cited.

Book I — Principles and Urban Planning

1.1.1 "Architecti est scientia pluribus disciplinis et variis eruditionibus ornata" — "The architect's knowledge is enriched by many disciplines and varied forms of learning." Text: Krohn (1912, 2). For the wider commentary on Book I, see Philippe Fleury, ed. and trans., De l'architecture, livre I (Budé, 1990); the reference is to Fleury's volume, not to a Book I edited by Gros.

Comparative note — Bk. 1.2.1 (the six principles). The foundational list —ordinatio, dispositio, eurythmia, symmetria, decor, distributio—is among the most debated passages, owing to the technical weight of the Greek terms Vitruvius juxtaposes. The reference editions agree in keeping the Graecisms and differ in nuance: Granger (Loeb, 1931) renders them with fixed equivalents; Rowland and Howe (Cambridge, 1999) stress the design sense (dispositio and its ideae); the Budé team (dir. Gros) analyses the debt to Hellenistic techne and rhetoric; Corso and Romano (Einaudi) expand the terminological commentary. The present edition keeps the Latin-Greek pairing and translates in its own words, adopting no external version. [Historical-architectural note] Of the six, symmetria and eurythmia govern proportion; ordinatio and distributio, measure and economy; decor, appropriateness; and dispositio unfolds the three ideae—ichnographia (plan), orthographia (elevation), and scaenographia (perspective)—the root of modern architectural representation.

1.3.2 "Haec autem ita fieri debent, ut habeatur ratio firmitatis, utilitatis, venustatis" — "These works must be designed with due regard for strength,

usefulness and beauty." Text: Krohn (1912, 13), with the three explanatory clauses that follow. For the Budé commentary on Book I, see Fleury (1990).

Book II — Materials

2.1.1 «Homines vetere more ut ferae in silvis et speluncis nascebantur» — "Men were born, after the ancient manner, like wild beasts in forests and caves." Collation: Rose 1899; Granger (Loeb) I, p. 78.

2.3.3 *"unum πεντάδωρον, alterum τετράδωρον dicitur "* — "one is called pentádoron, the other tetrádoron ". *Collation: Greek restored s. Rose 1899 and Granger (Loeb).*

Book III — Temples and proportions

3.1.1 *« paritur a proportione, quae graece ἀναλογία dicitur »* — « it arises from proportion, which in Greek is called analogia (proportionality) ». Comparison*: Rose 1899; Gros (Budé III); Granger (Loeb) I, p. 158.*

3.1.3 "item corporis centrum medium naturaliter est umbilicus" — "The natural center of the human body is the navel." Text: Krohn (1912, 59). The subsequent sentences describe the circle traced around the outstretched body and the relation between height and the span of the arms. Homo ad circulum et quadratum is an editorial description of the subject, not a verbatim reading of this sentence; it does not establish ad circinum as an inferior manuscript variant.

Book IV — Orders

Comparative note — Bk. 4.1.9–10 (katatexitechnos). The epithet the Athenians gave Callimachus is a term of disputed sense: compounded of κατατήκω («to melt down, consume») and τέχνη («art»), it admits two readings—«the one who refines or perfects art», praise of extreme finish, or, with an ironic edge, «the one who wastes himself in art», carrying it to the point of over-elaboration. The editions reflect this differently: Granger (Loeb, 1931) keeps the Greek and glosses the mastery; Rowland and Howe (Cambridge, 1999) register the ambivalence between virtuosity and excess; the Budé (dir. Gros) discusses the term within ancient art criticism; Corso and Romano (Einaudi) expand the commentary. The present edition keeps the Graecism and renders it in its own words, «the refiner of art», adopting no external version. [Historical-architectural note] To Callimachus (active in Athens, 5th c.

BC) tradition ascribes the invention of the Corinthian capital; the tale of the basket and the acanthus is aetiological, not historical (see the note to 4.1.9–10).

4.2.4 « *intersectio, quae graece μετόπη dicitur* » — « the intersection, which in Greek is called a metope ». *Comparison: Greek restored by Rose 1899; Gros (Budé IV).*

Book V — Public Buildings and Acoustics

5.5.1–3. Vitruvius describes tuned bronze vessels and then their response to the voice: "vox a scaena uti ab centro profusa" (5.5.3) — "the voice, spreading from the stage as from a center". Text: Krohn (1912, 104–105). The vessels are intended to enhance vocal clarity through sympathetic resonance; the Latin does not say that the "scene grows". For the Budé commentary on Book V, see Catherine Saliou (2009).

Book VI — The Private House

6.3.1–2. The five forms of cava aedium are named "tuscanicum, corinthium, tetrastylon, displuviatum, testudinatum". The testudinatum is a covered form, discussed in 6.3.2; it is not located at 6.1.1. Its roofing should not automatically be identified with a masonry vault. For the Budé commentary on Book VI, see Louis Callebat (2004).

Book VII — Finishes and Pigments

7.praef.4–7. The Attalid kings are associated with the library at Pergamum in paragraph 4. The narrative then turns to Ptolemy's library and literary contests at Alexandria. In paragraph 7 the king rewards Aristophanes and appoints him over the library: "Aristophanen vero amplissimis muneribus ornavit et supra bybliothecam constituit." These are distinct episodes; the appointment of Aristophanes is not attributed here to the Attalid kings.

Book VIII — The Water

8.3.16 "Στυγὸς ὕδωρ" — "water of the Styx." Collation: Greek restored after Rose 1899; Granger (Loeb) II, p. 162.

Book IX — Gnomonics and Astronomy

9.praef.4–5. Plato's doubling of the square is described by geometrical construction: "Hac ratione duplicatio grammicis rationibus ab Platone [...]

explicata est" — "In this way Plato explained the doubling by geometrical construction." Text: Krohn (1912, 196–197). Grammicis concerns drawn lines, not grammatical reasoning. For the Budé commentary on Book IX, see Jean Soubiran (1969).

Book X — Machines

10.1.1 "Machina est continens e materia coniunctio" — "A machine is a connected assemblage of material parts." Text: Krohn (1912, 224). The Budé text and translation of Book X are by Louis Callebat (1986), with Philippe Fleury responsible for the commentary; the roles should not be reversed.

10.7.1 « Ctesibica machina, quae in altitudinem aquam educit » — "the machine of Ctesibius, which raises water to a height." Collation: Rose 1899; Fleury, La mécanique de Vitruve; Granger (Loeb) II.

Appendix K · Apparatus fontium: Vitruvius' Greek sources

Vitruvius states in the preface to Book VII (7.praef.11-14) that his treatise is based on the works of the Greek architects and theorists who preceded him, most of whose works are now lost. This appendix lists, book by book, the principal Hellenic sources that scholars recognize as underlying Vitruvian doctrine, distinguishing those Vitruvius himself names from those inferred from the content. Unless otherwise indicated, the attributions follow Gros (Budé) and Rowland-Howe.

Book I — Principles and training of the architect

The doctrine of principles (*ordinatio*, *dispositio*, *eurythmia*, *symmetria*, *decor*, *distributio*) and the encyclopedic ideal of the architect reflect Hellenistic architectural theory and Greek paideia. Vitruvius cites Pytheos of Priene as an authority on the architect's comprehensive training (1.1.12). The philosophical background refers to the Pythagorean tradition and the pre-Socratic physiologoi (Thales, Democritus), invoked in the proems.

Book II — Materials and Origins of Construction

The history of the origin of architecture and the primitive hut is linked to Greek evolutionary theories (Democritus, Epicurus, and the Peripatetic tradition). For the doctrine of the elements and matter, Vitruvius follows Thales, Heraclitus, Democritus, and the Greek physics that he himself summarizes (2.2).

Books III-IV — Temples and the Orders

This is the most densely Greek core of the work. Vitruvius relies primarily on Hermogenes of Alabanda (2nd century BC), architect of the pseudodipteral temple of Artemis at Magnesia on the Meander and the monopteral temple of Dionysus at Teos, from whom he takes the rules of the Ionic order, the eustyle, and the critique of the dipteral (3.2-3.3; 4.3). Also contributing are Pytheos, author of the temple of Athena at Priene and, with Satyrus, of the Mausoleum at Halicarnassus; Arcesius, on Corinthian proportions; and the archaic writers whom Vitruvius

himself lists in 7.praef.12 (Silenus, Theodorus, Chersiphron and Metagenes, Ictinus and Carpio, Philo of Athens).

Book V — Public Buildings, Theater and Acoustics

For the theory of the acoustic vessels of the theater (echea) and the harmonic arrangement of the seating, Vitruvius adapts the Greek musical theory of Aristoxenus of Tarentum (5.4-5.5), whose doctrine of tetrachords he explicitly summarizes. The design of the Greek theater compared to the Latin one (5.7) derives directly from Hellenic models.

Book VI — Private Buildings and Climate

The theory of the suitability of housing to latitudes and climates (6.1) is based on Greek ethnography and scientific geography, particularly on the Hippocratic tradition (On Airs, Waters and Places) and on Posidonius.

Book VII — Finishes, stucco and painting

His preface is the main source for reconstructing Vitruvius's library: it lists the Greek authors on proportions and machines. For stage perspective (scaenographia) he cites the works of Agatharchus of Samos and the commentaries of Democritus and Anaxagoras on optics (7.praef.11).

Book VIII — Water

The doctrine on the search, properties and conduction of water follows the Greek authors of natural sciences; Vitruvius invokes Thales (water as a principle) and gathers material from the Peripatetic and Hippocratic tradition on the qualities of waters (8.3).

Book IX — Gnomonics and Astronomy

The most dependent on Greek scientific sources. Vitruvius follows Berossus the Chaldean (who introduced astrology to Greece), Aristarchus of Samos (to whom he attributes the sundial and heliocentrism), Eudoxus of Cnidus, Eratosthenes (measurement of the meridian), and Archimedes (9.praef.; 9.1-9.8). The anecdote about the crown comes from the tradition surrounding Archimedes.

Book X — Machines

Vitruvian mechanics rests on the Alexandrian school. For pumps, the hydraulic organ, and the water-lifting machine, Vitruvius follows Ctesibius of Alexandria (10.7-10.8); for artillery and catapults, Philo of Byzantium and Ctesibius; for the lifting screw, Archimedes (10.6); and for siege engines, Diades (Alexander's engineer), Agesistratus, and the Hellenistic siegecraft tradition (10.13-10.16).

Note.

The works of these authors have been almost entirely lost; they are known primarily through Vitruvius himself, Pliny the Elder (Natural History), and the surviving Greek mechanical treatises (Heron of Alexandria, Philo). This appendix does not aim to be exhaustive, but rather to guide the reader towards the profound Hellenic roots of De architectura.

Appendix L · Critical editions of Vitruvius: overview and assessment

The editions and translations that form the basis of the study of Vitruvius today are listed here in chronological order, along with a brief assessment of their usefulness. This list expands upon and formalizes what was presented in the Preliminary Note.

Valentin Rose (Teubner, 1867; 2nd ed. 1899)

An important modern critical edition of the Latin text, without a facing translation. Rose's recension and apparatus remain valuable for comparison. In the present edition, Krohn (1912) is the declared reference text; a quotation following a different reading requires an explanation at its locus.

Fritz Krohn (Teubner, 1912)

Krohn's critical edition is the declared reference text of this reading edition. It gives substantial weight to H while distinguishing the four principal witnesses H, S, E and G. Its constitution and apparatus should be compared with Rose and the relevant Budé volume at disputed passages, rather than reduced to a mechanical rule of following the oldest witness.

Auguste Choisy (Paris, 1909)

A bilingual Latin-French edition in four volumes, the work of an architect and construction historian. Without footnotes, it is notable for its introduction and its technical-construction approach; a precursor to editions geared towards architects.

Frank Granger (Loeb, Harvard, 1931–1934)

A two-volume bilingual Latin-English edition, based on the Harleianus. Convenient and accessible, but its translation and notes have aged and are now considered outdated in technical passages.

Curt Fensterbusch (Darmstadt, 1964)

Bilingual Latin-German edition with rigorous translation and notes; standard reference in the Germanic field for decades.

Silvio Ferri (Rome, 1960)

Italian edition with insightful philological commentary, especially valuable on matters of Greek technical terminology.

Collection of Universités de France, "Budé" (Les Belles Lettres, 1969–2009)

The definitive critical edition. Edited by Pierre Gros, with contributions from Louis Callebat, Jean Soubiran, Philippe Fleury, and others, it offers one volume per book with critical text, French translation, introduction, and monographic commentary. Unsurpassed in textual criticism and exegesis, it is the standard by which all modern editions are measured.

Antonio Corso and Elisa Romano, dir. P. Gros (Einaudi, 1997)

Italian edition with Latin text and extensive commentary; one of the best study tools available, heir to the rigor of the Budé edition.

Ingrid D. Rowland and Thomas Noble Howe (Cambridge, 1999)

The modern reference in English. Rowland's translation, insightful commentary, and technical reconstructions by Howe, useful for the architect. It does not reproduce the facing Latin text.

In Spanish

José Ortiz y Sanz (1787), monumental but monolingual and linguistically distant; the manuscript of Lázaro de Velasco (16th century), of historical value; and the widely used version by José Luis Oliver Domingo (Alianza, 1995), competent but lacking a Latin text. Manzanero's partial translation (Gredos) covers only the first five books. Hence the gap that this complete bilingual edition aims to fill.

Bibliographical note: orientation of the sources

The final bibliography can be read in four layers. First, the primary sources: De architectura itself in the editions by Rose and Krohn, and the ancient testimonies on Vitruvius (Pliny the Elder, Frontinus, Faventinus, and Palladius, which epitomize it). Second, the modern critical editions and translations: Budé, Loeb, Corso-Romano, and Rowland-Howe, reviewed in Appendix L. Third, the historical and archaeological studies: Gros, Callebat, Pellati, Coarelli, and the

bibliography on the basilica of Fano, including the 2026 discovery. Fourth, the studies of symbolic interpretation and hermeneutical hypotheses, which this edition presents as the author's proposal, clearly differentiated from the three previous layers. The reader should bear this hierarchy in mind: the first three layers support verifiable assertions; the fourth, interpretations.

Appendix M · Stemma Codicum and the Manuscript Transmission

This appendix sets out the genealogy of the surviving manuscripts of the *De architectura*, traces the principal stages of its transmission from Antiquity to the *editio princeps*, and explains the reasoning — the *recensio* — by which the two main branches of the tradition are reconstructed. The classification rests not on any single isolated error but on shared conjunctive errors (*errores coniunctivi*): when two or more codices preserve the same improbable corruption, a common ancestor may be inferred.

1. Chronology of the transmission (1st c. BC – 15th c. AD)

c. 27–23 BCE — Composition. Marcus Vitruvius Pollio composes the ten books of the De architectura under Augustus, to whom the work is dedicated. It is the only complete treatise on architecture to survive from classical Antiquity.

1st–3rd c. CE — Ancient circulation. The work was transmitted through successive copies; the author's autograph has not survived. The surviving witnesses do not establish when it was lost.

Late Antiquity and the early Middle Ages — The text passed through copies that are now lost. Shared lacunae and textual disturbances allow editors to infer a common exemplar behind the surviving witnesses; neither its physical form nor an exact date is established by that inference alone.

6th–8th c. — The dark age of transmission. Documentation is extremely scarce. The survival of the *De architectura* through these centuries is one of the most remarkable episodes in the preservation of Roman literature.

9th c. — Carolingian Renaissance. Under Carolingian patronage, many ancient works were copied afresh. Harley MS 2767 (H) is an important early witness to De architectura. Its age and textual value do not establish that every surviving manuscript descends from it. Krohn distinguishes the H–S grouping from the Gudianus witnesses E and G; their relationships must be assessed through shared readings, corrections and losses.

10th–13th c. — Monastic and scholastic preservation. The work circulates in monastic libraries and cathedral schools. New copies appear; errors of

transcription, omissions and interpolations multiply, and some witnesses show contamination through the collation of different exemplars.

14th–15th c. — Humanist rediscovery. Italian scholars revive their interest in the technical literature of Antiquity; Poggio Bracciolini and others recover and diffuse dispersed manuscripts. Vitruvius becomes essential reading for Alberti, Francesco di Giorgio Martini and Leonardo da Vinci. Humanistic copies circulate widely.

1486 — Editio princeps. The first printed edition of the *De architectura*, published in Rome by Fra Giovanni Sulpicio da Veroli, marks the passage from manuscript to print and opens the modern editorial tradition.

2. General scheme of the transmission

The surviving witnesses are commonly referred to a lost archetype, but the relationships between their branches must be stated according to a named critical edition. Krohn's preface (1912, VIII) distinguishes H and S from E and G. The age and authority of H do not justify treating every other witness as its direct descendant.

```
Lost common exemplar (Ω): inferred from shared lacunae and textual
disturbance.
H–S: Harleianus 2767 and Selestadiensis.
E–G: Gudianus 132 and Gudianus 69.
These paired witnesses summarize Krohn's grouping; they do not
assign direct descent to every copy.
The manuscript tradition passes into print in the Roman editio
princeps prepared by Giovanni Sulpicio da Veroli in the 1480s.
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3. Stemma codicum of the De architectura

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The grouping is visualized in Figure 22 and cataloged in Table 9.
The diagram reports H–S and E–G as distinguished by Krohn; it is not
a complete stemma of all extant manuscripts.
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4. Mechanisms of textual change and their stemmatic value

The following examples illustrate how textual changes can arise. They are methodological examples, not reported readings assigned to named Vitruvian witnesses. A change acquires stemmatic significance only when its distribution, probability, and relation to contamination have been established from the apparatus or the manuscripts.

I. Omission by homoeoteleuton. A scribe's eye may pass between similar endings and omit the intervening text. A shared, unlikely omission may

indicate common ancestry, provided independent recurrence and later correction have been considered.

II. Dittography. A word or phrase may be copied twice. The same repetition in several witnesses can be significant, but a common copying error may also arise independently.

III. Corruption of Greek terminology. An unfamiliar Greek expression may be altered, transliterated inconsistently, or replaced. Its evidential value depends on the precise reading and its distribution among identified witnesses.

IV. Explanatory substitution. A technical expression may be replaced by a more familiar one. Such a substitution must be documented before it is attributed to a particular witness or branch.

V. Transposition. Words, clauses, or larger units may change position. Shared unusual dislocations can be valuable evidence, particularly where they reveal the arrangement of an earlier exemplar.

VI. Grammatical normalization. A copyist or editor may regularize an unfamiliar construction or spelling. An assimilated spelling is not inherently preferable to an unassimilated one, and common normalizations alone rarely establish a unique genealogy.

VII. Numbers and proportions. Numerals, fractions, and dimensional signs are especially vulnerable in technical texts. Agreement must be assessed at a specific locus; a plausible reconstructed dimension does not independently establish the transmitted figure.

VIII. Suppression of repetition. A passage judged redundant may be shortened. The editor must distinguish deliberate abbreviation from accidental omission and from an author's own repetition.

IX. Explanatory additions. A marginal or interlinear gloss may enter the running text. Its origin and date cannot be inferred from brackets alone; the relevant edition's editorial signs must be read in context.

X. Contamination. Consultation of more than one exemplar can produce a witness that shares readings with different groups. A stemma therefore requires an account of corrections and mixed readings as well as a diagram of descent.

5. The primacy of H and the constitution of the text

Harley MS 2767 (H), copied in the first quarter of the ninth century, is the oldest known surviving witness. Krohn distinguishes its side of the tradition, with S, from the Gudianus witnesses E and G. The precise genealogy remains an editorial reconstruction; neither the age of H nor a simplified stemma proves that all later manuscripts descend directly from it.

The constitution of the text requires comparison of readings, not a presumption that all witnesses descend directly from H. Krohn's printed text supplies the principal control for the running Latin in this edition. The explanatory notes below discuss the adopted wording and its interpretation; an attribution to an individual manuscript requires an identifiable apparatus entry or direct examination of that witness.

6. Textual commentary: selected passages

The following notes explain five passages important for the language and interpretation of the treatise. The wording cited is checked against Krohn (1912). They are explanatory commentary, rather than a newly established manuscript apparatus; the text of an edition, an editorial conjecture and the reading of a particular witness must be distinguished.

1. Dedication and political ideology — De architectura I, preface.
parenti tuo — I, preface 2. Krohn prints parenti tuo and subsequently imperium parentis. The dedication presents continuity between Caesar and the emperor addressed by Vitruvius. The political and legal implications of parens require interpretation in that context; the wording alone does not establish the precise date of composition.

in tuam potestatem transtulisset — I, preface 2. This is the wording printed by Krohn. Potestas is important to the dedication's representation of imperial authority, but an alternative wording should not be assigned to the recentiores without an identified critical source.

aedis Augusti — V.1.7. Krohn's printed passage describes the pronaos of a temple of Augustus beside the basilica; V.1.8 also mentions pronaum aedis and tribunal. The presence of Augustus in the edited text must be distinguished from an alleged omission by H, which is not established here. Neither an authorial second edition nor a Carolingian interpolation follows without further textual evidence.

2. The definition of the discipline — De architectura 1.1.1.
Architecti est scientia — I.1.1. Krohn prints the genitive architecti. The sentence defines the architect's body of knowledge, qualified by pluribus disciplinis et variis eruditionibus ornata. Its relation to the person of the architect matters to the argument; the abstract paraphrase 'architecture is a science' should not be substituted for a diplomatic quotation.

fabrica — I.1.1. Krohn's text defines fabrica as continuata ac trita usus meditatio. The term concerns sustained practical activity and must be read alongside ratiocinatio. A modern explanatory gloss is distinct from an attested medieval reading.

ratiocinatione — I.1.1. Krohn prints ea nascitur ex fabrica et ratiocinatione. In the following definition, ratiocinatio explains and demonstrates what has been made through knowledge and reasoning. Reducing the term to numerical calculation alone would narrow its meaning; that semantic point does not establish the readings of H, G or later witnesses.

3. The Greek aesthetic vocabulary — De architectura 1.2.1. The Greek words suffered grave degradation in the manual transmission, since the Western medieval copyists of the Carolingian scriptoria did not know the Greek alphabet (*Graeca sunt, non leguntur*).

τάξις — I.2.1. Krohn prints τάξις as the Greek counterpart of ordinatio. The explanatory discussion concerns order and the measured organization of the work. Claims about a blank in H, the form tasis in G, or a first restoration by Turnebus require separate documentary support and are not adopted as established variants here.

διάθεσιν — I.2.1. Krohn prints this accusative form after hanc autem Graeci; the dictionary form is διάθεσις. The corresponding Latin term is dispositio. Vitruvius subsequently describes its ideae as plan, elevation and scenic representation. These are textual and conceptual observations, not proof of a particular corrupt reading in a named manuscript.

symmetria — I.2. The word concerns the commensurable relation of the parts to one another and to the whole through a common measure. It should not be reduced to bilateral symmetry. An anonymous scholium or the wording of a later manuscript cannot be treated as evidence without a source and location.

4. Pozzolana and the geology of concrete — De architectura 2.6.1.

genus pulveris — II.6.1. Krohn prints Est etiam genus pulveris and locates the material in the districts around Vesuvius. Vitruvius describes its mixture with lime and aggregate and its hardening under water. This is a technical account of volcanic building material; the alleged variant arenae is not assigned to a manuscript family here.

circa Vesuvium montem — II.6.1. The phrase locates the volcanic material geographically. The received historical dating of Vitruvius places the work before the eruption of 79 CE, but this phrase alone cannot prove that a later copyist or interpolator would necessarily have mentioned that eruption.

5. The figure of man and the genesis of proportion — De architectura 3.1.3.

The well-proportioned body — III.1.1–3. Krohn's text relates the design of temples to the proportional relations of a well-formed human body, hominis bene figurati. The circular and square constructions are both described in III.1.3. They should not be presented as a Renaissance addition to an otherwise non-geometrical ancient passage.

item corporis centrum medium naturaliter est umbilicus — III.1.3. Krohn prints the navel as the center of the circle traced around the outstretched body. The same section then describes the square derived from height and arm span. Leonardo's later distinction of centers belongs to the reception and graphic interpretation of the passage; it is not a textual conjecture in Vitruvius's Latin.

Appendix N · Restitutio vocabulorum Graecorum

Vitruvius frequently uses Greek technical vocabulary, sometimes in Greek script and sometimes in Latinised forms. This glossary supplies lexical forms, equivalents and explanations. A Latin transliteration is not automatically a corruption, and a dictionary lemma need not be the inflected form printed in the treatise. The entries do not establish individual manuscript readings without an identified critical source. Appendix D provides selected page references.

I. Aesthetic and modular concepts (Book I, chapter 2)

1. τάξις (taxis)

Textual form: τάξις in Krohn, I.2.1.

Restitution: τάξις (nominative singular, from τάσσω, 'to set in order', 'to arrange in a row').

Vitruvian equivalent: ordinatio.

Note: not to be confused with the mere placing of objects. In Aristotle and Hellenistic usage τάξις implies a mathematical and quantitative ordering. Vitruvius defines it as the measure of the members of a work in relation to the whole through the module (*modulus*): the establishment of the basic metric pattern.

2. διάθεσις (diathesis)

Textual form: διάθεσιν, accusative singular, in Krohn, I.2.1.

Restitution: διάθεσις (Vitruvius uses the accusative διάθεσιν; from διατίθημι, 'to dispose', 'to arrange effectively').

Vitruvian equivalent: dispositio.

Note: the expression of the τάξις in design. It is made visible through three modes of graphic representation (*ideae*): *ichnographia* (plan), *orthographia* (elevation) and *scaenographia* (perspective).

3. οἰκονομία (oikonomia)

Textual form: οἰκονομία in Krohn, I.2.1; oeconomia is a Latin transliteration.

Restitution: οἰκονομία (from οἶκος, 'house', and νόμος, 'law, management').

Vitruvian equivalent: distributio.

Note: under Augustus the term carries a double, technical and financial nuance. It implies the prudent management of materials and budget (*sumptus*), but also the fitting of the building to the owner according to social status, and the pragmatic adaptation of the architecture to the local climate.

4. εὐρυθμία (*eurythmia*)

Corrupt reading: eurithmia, *euritmia* (direct Latinisation).

Lexical form: εὐρυθμία, with the prefix εὖ and the noun ῥυθμός, 'rhythm' or 'ordered movement'.

Note: a qualitative concept of visual perception. Whereas τάξις is purely mathematical and objective, εὐρυθμία is the aesthetic result perceptible to the human eye: the graceful and harmonious appearance of the whole when contemplated.

5. συμμετρία (*symmetria*)

Latinised form: symmetria. The Greek lemma explains the technical vocabulary; variants such as simetria require an identified source before they can be assigned to a witness.

Restitution: συμμετρία (from σύν, 'with', and μέτρον, 'measure').

Note: a critical point for collation. In late and medieval Latin the term degraded semantically to 'bilateral symmetry'. The classical sense used by Vitruvius must be recovered: modular symmetry or commensurability — the exact proportional relation that binds a single element (for instance, the diameter of a column) to all the other parts and to the whole.

II. Architectural and engineering elements

6. σκιαθήρας (skiatheras)

Lexical comparison: the Greek expression relates shadow to measurement. It is included here as explanatory vocabulary, without asserting that σκιαθήρας is a verified manuscript reading at I.1.4.

Restitution: σκιαθήρας (accusative plural; from σκιά, 'shadow', and θηράω, 'to hunt, to capture').

Definition: literally 'the hunters of shadows'. The precise technical term for the gnomons or rods of sundials that cast the shadow upon the dial to measure the

hours and determine the equinoxes — indispensable for orienting buildings to the wind-rose.

7. λογεῖον (logeion)

Textual form: λογεῖον in Krohn, V.7.2; the same section subsequently uses the Latinised genitive logei.

> *Restitution:* λογεῖον (from λόγος, the place from which speech is delivered).

Definition: in the Greek-type theater, the raised wooden platform above the *proskenion* on which the actors performed. Vitruvius contrasts the Greek λογεῖον (narrower and higher) with the Roman *pulpitum* (wider and lower), since in the Roman theater the senators and magistrates occupied the *orchestra*.

8. ἀναλογία (analogia)

Greek lemma: ἀναλογία. Vitruvius explicitly connects proportion with Greek terminology in III.1.1.

Restitution: ἀναλογία (from ἀνά, 'according to', and λόγος, 'ratio, proportion').

> *Vitruvian equivalent: proportio*.

Note: Vitruvius defines *proportio* as the Latin rendering of ἀναλογία — the application of one and the same ratio at different scales; the principle that allows the proportions of the human body to be transferred to the dimensions of a temple.

III. Scenic and theatrical architecture (Book V)

9. θυμελικοί (thymelikoi)

Latinised form: thymelici in Krohn, V.7.2. The Greek plural below explains the term rather than replacing a demonstrated corruption.

Restitution: θυμελικοί (nominative plural, from θυμέλη, the altar or platform at the center of the Greek *orchestra*).

Definition: the lyric, musical and dancing performers (musicians, flautists, chorus members) who, unlike the tragic and comic actors, performed below, on the area of the *orchestra*, in keeping with the ritual conventions of the Hellenic spectacle.

10. σκηνικοί (skenikoi)

Latinised form: scaenici in Krohn, V.7.2. The Greek plural below is supplied for lexical explanation.

Restitution: σκηνικοί (nominative plural, from σκηνή, ‘tent, booth’ and later the ‘scene’).

Definition: the dramatic actors (the interpreters of the dialogues of tragedy, comedy and satyr-play). In the layout of the Greek theater described by Vitruvius the σκηνικοί were restricted to the λογεῖον and never descended to the *orchestra*, a spatial and generic boundary that conditioned the acoustic and iconographic design of the building.

Editorial note. In the final typographic collation of these terms the compositor must use fonts furnished with the correct breathings (smooth and rough) and accents (acute, grave, circumflex) according to the rules of classical polytonic Greek. The Renaissance editions tended to simplify or omit the breathings in compound words — an error that the modern critical edition must not reproduce.

Appendix O · Index verborum Latinorum

An index of the principal Latin technical terms of the treatise, with a brief gloss and the chief passages (by book, chapter and section) in which each is defined or discussed. It complements the Index verborum Graecorum (Appendix D) and the Glossary (Appendix A).

A

aedificatio — the art of building, one of the three parts of architecture (with gnomonice and machinatio) Cf. 1.3.1.

aedes (aedis) — temple, the principal subject of Books III and IV Cf. 3.1–4.9.

analemma — the geometric projection of the celestial sphere onto a plane for designing sundials Cf. 9.7.

antae — the projecting wall-piers that terminate the side walls of the cella Cf. 3.2.2; 4.4.1.

architectus — the architect, defined by the union of fabrica and ratiocinatio Cf. 1.1.1.

araeostylos — the widely spaced intercolumniation Cf. 3.3.1.

C

caementum / opus caementicium — rubble bound with mortar; Roman concrete Cf. 2.4; 2.7.

cavum aedium — the central covered space (atrium) of the Roman house Cf. 6.3.1.

cella — the inner chamber of a temple, housing the cult statue Cf. 3.4; 4.4.

contractura — the diminution of the column shaft towards the top Cf. 3.3.12; 4.3.4.

D

decor — propriety: the faultless appearance of a work composed of approved details Cf. 1.2.5.

diastylos — the wide intercolumniation (three diameters) Cf. 3.3.1.

dispositio — disposition; the apt placing of things and the elegant effect of the design Cf. 1.2.2.

distributio — distribution; the economical management of materials, site and cost Cf. 1.2.9.

E

echea (vasa) — the bronze sounding-vessels tuned and placed in the theater to amplify the voice Cf. 5.5.1–8.

entasis — the slight swelling of the column shaft that corrects the optical illusion of concavity Cf. 3.3.13.

eustylos — the best-proportioned intercolumniation (two and a quarter diameters) Cf. 3.3.6.

F

fabrica — the continued and practised manual experience of construction Cf. 1.1.1.

firmitas — structural solidity; the first member of the Vitruvian triad Cf. 1.3.2.

G

gnomon — the shadow-casting rod of a sundial; the index of the analemma Cf. 1.6.6; 9.7.

gnomonice — the science of sundials and timekeeping; the second part of architecture Cf. 1.3.1; 9.

I

ichnographia — the ground-plan, one of the three modes of graphic representation (ideae) Cf. 1.2.2.

M

machinatio — mechanics; the making of machines, the third part of architecture Cf. 1.3.1; 10.1.

modulus — the module: the unit of measurement from which all the proportions of a work derive Cf. 3.3.7; 4.3.3.

O

opus reticulatum / incertum — the netted and the irregular types of facing masonry Cf. 2.8.1.

ordinatio — ordering; the quantitative arrangement of the members of a work by a module Cf. 1.2.2.

orthographia — the upright front view (elevation) of a building Cf. 1.2.2.

P

pronaos — the front porch of a temple, before the cella Cf. 4.4.1.

proportio — proportion, the Latin rendering of the Greek analogia Cf. 3.1.1.

pulvis (puteolanus) — pozzolana; the volcanic dust of the Bay of Naples that sets hydraulically under water Cf. 2.6.1.

pycnostylos — the close intercolumniation (one and a half diameters) Cf. 3.3.1.

R

ratiocinatio — theoretical reasoning; the demonstrative knowledge grounded in geometry and proportion Cf. 1.1.1.

S

scaenographia — the perspective or scene-drawing; the third of the ideae Cf. 1.2.2; 7.pr.11.

scamilli impares — the unequal leveling-blocks that produce the upward curvature of the stylobate Cf. 3.4.5.

symmetria — modular commensurability: the agreement of the parts with one another and with the whole Cf. 1.2.4; 3.1.1.

systylos — the narrow intercolumniation (two diameters) Cf. 3.3.1.

U

utilitas — utility; the second member of the Vitruvian triad Cf. 1.3.2.

V

venustas — beauty; the third member of the Vitruvian triad Cf. 1.3.2.

VITRUVIUS TODAY: SURVIVAL OF A CANON

De architectura is not a museum piece. Its categories continue to operate, sometimes explicitly, in contemporary architectural culture, and it is

appropriate to conclude this study by pointing out three lines of enduring influence.

The Triad and the Modulor. The celebrated triad *firmitas*, *utilitas*, *venustas*—solidity, utility, beauty—continues to be the implicit framework by which built works are judged. Its most direct descendant in the 20th century is Le Corbusier's Modulor (1948), a system of proportions based on the measurements of the human body and the golden section, which reinterprets, in modern language, the ancient Vitruvian doctrine of the body as measure (homo bene figuratus, De architectura 3.1). Le Corbusier consciously acknowledged himself as the heir to this tradition: the Modulor is, in essence, a reinterpretation of Vitruvius's anthropometric canon in light of industrial standardization.

Proportion, Parametrization, and BIM. The Vitruvian idea of *symmetria*—the commensurability of the parts with the whole based on a module—conceptually prefigures current parametric design, where the geometry of the building is governed by relationships and rules rather than fixed dimensions. Building Information Modeling (BIM) methodologies, which integrate design, construction, and maintenance information into a single model, also revive Vitruvius's ambition of an architecture understood as a holistic knowledge that articulates materials, technique, function, and understanding.

Firmitas and Sustainability. Finally, Vitruvius's concern for site selection, orientation, air quality, and the use of local resources (Books I, VI, and VIII) resonates strongly with the contemporary agenda of sustainability and bioclimatic architecture. *Firmitas*, as understood today, is not only structural solidity but also durability and environmental responsibility: the building that endures and is wisely integrated into its surroundings. In this sense, Vitruvius remains a relevant voice twenty centuries later.

Comparative Table: The Proportions of the Orders, from Vitruvius to the Treatise Writers. Vitruvius's doctrine of the orders was received, systematized, and sometimes simplified by the great treatise writers of the Renaissance. The following table compares, for illustrative purposes, the relationship between the height of the column and its lower diameter (expressed in diameters) according to Vitruvius and later canons. Renaissance figures, especially Vignola's rule, tend

to regularize into a clean progression what in Vitruvius was more variable and dependent on the type of intercolumniation.

Appendix P · Normae interpretationis: fixed translation equivalents

To ensure terminological consistency throughout the translation, the principal technical terms are rendered uniformly according to the table below. Each Latin or Greek term is given in italics at its first occurrence in every book, followed where useful by the established English equivalent.

Term (Latin / Greek)	Fixed English equivalent
symmetria (συμμετρία)	commensurability — the modular correspondence of the parts to the whole and to a common unit; not bilateral symmetry in the modern sense
eurythmia (εὐρυθμία)	visual harmony — the graceful adjustment of proportion as perceived by the eye
ordinatio (τάξις)	modular ordering — the quantitative disposition of the members by a common unit (modulus)
dispositio (διάθεσις)	arrangement — the qualitative organization of the design (ichnographia, orthographia, scaenographia)
decor	propriety — the formal correctness and fitness of a building to its purpose
distributio (οἰκονομία)	economy — the proper management of materials, site, and expense
firmitas	structural strength and durability
utilitas	functional convenience (utility)
venustas	beauty and aesthetic delight
fabrica	practice — the manual, constructive skill of the architect
ratiocinatio	theoretical reasoning — the demonstrative knowledge grounded in geometry and proportion
rata pars	fixed module — the standard unit governing proportion
cochlea (κοχλίας)	water-screw — the Archimedean helical screw for raising water
opus signinum	waterproof hydraulic mortar of lime, sand, and crushed tile
scamilli impares	a disputed technical term, generally associated with a graduated adjustment of the stylobate's level or curvature; no single reconstruction is imposed
epistylium (ἐπιστύλιον)	architrave — the principal horizontal member resting on the capitals and the first member of the entablature

Table 7. Fixed translation equivalents of the principal technical terms

Appendix Q · Status quaestionis: a survey of modern Vitruvian scholarship

The study of *De architectura* has been transformed over the past century by new critical editions, philological commentary, and—most recently—archaeology. The following survey outlines the principal questions that continue to occupy specialists, so that the reader may situate the present edition within the living debate.

On the text and its transmission. The editions of Valentin Rose (1867; 1899) and Fritz Krohn (1912) remain central to the constitution of the Latin text. Harley MS 2767 is the oldest known surviving copy and a witness of substantial authority. Krohn distinguishes H and S from E and G; the later witnesses cannot all be dismissed as a single contaminated group. The weight of each reading must be considered at its locus.

On the date and unity of the work. The treatise is generally dated between 27 and 23 BCE and dedicated to Augustus. While some scholars have detected signs of stratified composition or later interpolation in particular passages, the substantial unity of the ten books is now broadly accepted.

On the author's identity. Almost nothing is known of Vitruvius's life beyond what the prefaces disclose: military service under Caesar and a pension obtained through the mediation of Octavia. The cognomen *Pollio* rests on slender and late evidence, and the older identification of the author with Mamurra (proposed by Thielscher) is now generally rejected.

On the foundational categories. The interpretation of *ordinatio*, *dispositio*, *eurythmia*, *symmetria*, *decor*, and *distributio* is a central crux. Following the commentary of Pierre Gros in the Budé edition and the philological studies of Louis Callebat, *symmetria* is now understood as commensurability—modular proportion—rather than modern bilateral symmetry. In the Anglophone sphere, the translation and commentary of Ingrid D. Rowland and Thomas Noble Howe (1999) and the work of Indra Kagis McEwen on the *Vitruvian body* have reframed much of the discussion.

On the Greek sources and reception. Vitruvius drew on lost Greek treatises, including those of Hermogenes and Pytheos and the authors cataloged in Book

VII. The extent of his Hellenistic debt remains a subject of scholarship. Leonardo's drawing of about 1490 belongs to an early phase of Renaissance engagement with human proportion. Giocondo (1511), Cesariano (1521), Barbaro and Palladio, and subsequently Perrault (1673) represent later stages in the editing, illustration and critical reception of the treatise.

On the new evidence. The provisional identification, in January 2026, of a basilica at Fanum Fortunae — the only building Vitruvius claims as his own — opens a fresh chapter: should it be borne out by the full publication of the excavation, it would permit his theoretical prescriptions to be tested against material remains for the first time.

NOTE TO THE TEXT, SIGLA AND EDITORIAL RATIONALE

Ratio editionis

This edition presents the Latin text of the ten books of De architectura with an accompanying English translation, technical commentary, and a selective apparatus. It is a reading edition grounded in the named printed editions; the identification of each quoted reading remains essential to its philological argument.

The stated reference text of this reading edition is Fritz Krohn's Vitruvii de architectura libri decem (Leipzig: B. G. Teubner, 1912). Rose (1899) remains a comparative edition, and the Budé volumes provide further textual and architectural reference where cited. The English derives from the author's Spanish translation and is checked against the Latin at doubtful terms and passages. References to these editions do not constitute a new collation of the manuscripts or certify that every Budé apparatus has been checked afresh. Substantive departures from the stated base require explicit explanation at the relevant locus.

The manuscript tradition. De architectura survives through a complex medieval transmission. Harley MS 2767 is an important Carolingian witness, while Gudianus 69 preserves a collateral line of value for textual criticism. The documented provenance of Harley must be distinguished from accounts of Renaissance discoveries at St Gall. The original

illustrative program does not survive intact: later reconstructions and artistic interpretations are identified as such in the figure captions and index.

Restoration of the Greek. Vitruvius peppers his prose with Greek technical terms (*τάξις, συμμετρία, εὐρυθμία, διάθεσις*, and many more). The orthography of Greek technical terms follows the reference editions, including conventional accentuation and breathing marks; substantive disagreements with the transmitted text are identified in the apparatus. Transliterated forms are supplied only where they assist comprehension.

Formal criteria and citation system. Technical terms are italicized where appropriate. References identify the book, chapter and section, for example Vitr. De arch. 5.praef.3. Latin quotations preserve the adopted reading, including unassimilated forms such as conlocavi, unless an intervention is expressly recorded. Readings are not selected merely by the age of a witness or attributed to H without documentary support. Bibliographical references follow the Chicago Manual of Style, 18th edition (2024), with American English spelling. Academic precision and fluent syntax govern the English prose; titles and documentary quotations retain their source forms.

CONSPECTUS SIGLORUM (OVERVIEW OF THE SIGLA)

Manuscripts (sigla)

H Harley MS 2767 (London, British Library), first quarter of the ninth century. An early and important witness; Krohn groups it with S in his preface (1912, VIII). Its date alone does not make every surviving manuscript a descendant of H.

G Codex Gudianus 69 (Guelferbyti, Herzog August Bibliothek), 11th century — a key witness of another lineage, which sometimes preserves its own readings.

L (Rose): Leiden, Universiteitsbibliotheek, Voss. lat. F. 88; tenth century in Rose's sigla list. See Table 9.

P and p (Rose): Paris, BnF, Latin 10277 (Pithoeanus) and Latin 7227 respectively. These are separate witnesses; see Table 9.

recent.: later witnesses, individually identified by the critical edition being cited. Their relationships are not inferred from date alone.

Editions

Rose V. Rose, Vitruvius De architectura libri decem, Leipzig (Teubner) 1899.

Kr. F. Krohn, Vitruvius De architectura libri decem, Leipzig (Teubner) 1912.

Gran. F. Granger, Vitruvius on Architecture, Loeb Classical Library, 1931 – 1934.

Bud. editio Belles Lettres (Collection des Universités de France), 1969 – 2009.

Critical signs

[ ] words to be excluded by the editor (excluded).

< > words to be added by the editor (added, supplemented).

† corrupt place (cross of despair).

coni. coniecit.

om. omitted.

the rest of the codices.

Stemma codicum (genealogy of the manuscripts)

Krohn's account proceeds from a lost common archetype, inferred from shared lacunae and textual disturbance; it does not establish an exact date for that lost exemplar.

Four principal witnesses are distinguished in his preface.

H and S form one group; E and G stand on the other side of the tradition.

The following diagram summarizes that grouping without adding unverified intermediate copies.

H is Harleianus 2767; S is Selestadiensis.

E is Gudianus 132, an excerpting witness; G is Gudianus 69, containing the complete treatise.

The authority of H is substantial, but this does not prove that G or every other surviving copy descends from it. The grouping reported here follows Krohn (1912, preface VIII). More detailed genealogies require their own sources and a separate account of contamination.

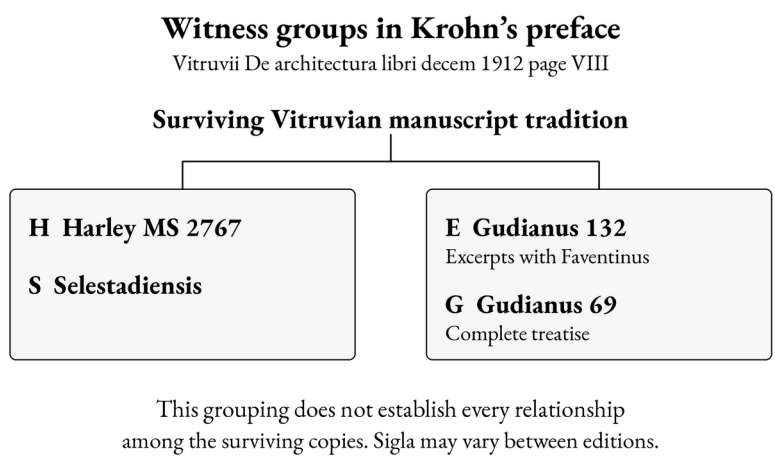


Figure 22. Editorial diagram prepared for this edition after Fritz Krohn, Vitruvii de architectura libri decem (Leipzig, 1912), preface VIII. It reports the grouping H–S and E–G. The grouping is not a complete genealogy and does not establish direct descent among every witness.

Schematic summary of Krohn (1912, VIII); this is a grouping of the principal witnesses, not a complete genealogy of the surviving manuscripts.

The grouping in Krohn's preface

Sigla and the reconstruction of the tradition. In Krohn's preface (1912, VIII), H denotes Harley MS 2767; S the Selestadiensis; E Gudianus 132, a tenth-century excerpting witness interspersed with Faventinus; and G Gudianus 69, an eleventh-century witness containing the complete treatise. Krohn groups H with S and E with G. Other editors may employ different sigla or propose more elaborate relationships. In particular, E must not be assumed to mean Escorialensis when reporting Krohn's apparatus.

The procedure adopted in this reading edition is to identify the printed base, record substantive departures from it and cite manuscript readings only through a verifiable apparatus or documented inspection. The age of H does not make its reading automatically preferable at every passage. In Krohn's account, H and S must be distinguished from E and G; the sigla and relationships used by another editor must be established from that edition rather than transferred without qualification.

The stemma is a reconstruction of relationships among witnesses, not an independently preserved document. Krohn (1912, preface VIII) groups H with S and E with G. The schematic tree in this appendix should be read alongside that account; it must not at the same time place E within H's branch without specifying a different use of the siglum and documenting the alternative reconstruction. A proposed relationship between manuscripts and the editorial weight of an individual reading are separate questions.

Conspectus of principal textual cruces. (1) At 3.4.5, scamilli impares is retained as a disputed technical expression: the missing explanatory figure prevents an unequivocal reconstruction. (2) At 4.1.9, Krohn prints pupulis in the account of the young woman's playthings; the different form pauculis must not be attributed to the adopted running text, and poculis must not be assigned to Rose or Granger without checking their exact readings. (3) At 5.1.6–10, the basilica at Fano requires a distinction between Vitruvius's transmitted description, editorial reconstructions and archaeological identification; no supposed T-shaped corruption is established by the label alone. (4) At 8.6.1, semipede is the adopted reading for the gradient; a comparison with Pliny's sicilici belongs to the apparatus and does not by itself establish unanimity among all Vitruvian manuscripts. (5) At 9.praef.9–12, the crown experiment

should be translated through its measurements of weight and displaced volume; its historical interpretation must remain distinct from the later formal statement of buoyancy. At 9.praef.14, Krohn (1912, 200) marks the clause beginning in quo etiam utebatur anulo as corrupt, and a confident translation about an optical test is therefore unwarranted.

Apparatus fontium (selective). Vitruvius acknowledges his debts —above all in the preface to Book VII—, though all his sources are lost. The principal authorities he names are, by field: in architecture and proportions, Pythius and Hermogenes of Priene, Silenus, Theodorus, Arcesius, and Philo (and the less celebrated Nexaris, Theocydes, Demophilos, Pollis, Leonides, Silanion, Melampus, Sarnacus, and Euphranor); in mechanics (7 pr. 14), Diades, Archytas, Archimedes, Ctesibius, Nymphodorus, Philo of Byzantium, Diphilus, Democles, Charidas, Polyidus, Pyrrus, and Agesistratus; in music, Aristoxenus of Tarentum; in scene-painting and perspective, Agatharchus of Samos, with Democritus and Anaxagoras; in astronomy and gnomonics, Berosus the Chaldean, Aristarchus of Samos, Eudoxus, Apollonius, Scopinas, Thales, and Anaximander; in philosophy and science, Plato (the doubling of the square, 9 pr.) and Pythagoras. Among the Latins he cites Fuficius (the first to write on architecture in Latin), Terentius Varro (who included architecture among his Disciplinae), and Publius Septimius. Modern scholarship (Granger, Gros) accepts that Vitruvius selected what was useful from these works, partly through Varro, partly at first hand.

Apparatus criticus selectus (a worked example)

At 1.1.1, Krohn (1912, 2) prints perficit[ur] and opus [est]. Square brackets mark letters or words excluded from the constituted text. This is a documented example of an editor's intervention, distinct from a newly inspected manuscript reading. A manuscript variant must identify the witness, the locus and the apparatus or folio from which it is reported.

Glossary of philological principles (for the non-specialist reader)

Archetype (Ω) — the lost common ancestor from which all surviving manuscripts descend; because it is lost, the editor must reconstruct its readings from the descendants.

Stemma codicum — the genealogical tree of the manuscripts, showing which copies depend on which and so which readings are likeliest to go back to Ω.

Apparatus criticus — the band of notes printed beneath the Latin text recording the variant readings of the witnesses and the reasons for the editor's choice; what may look like "mere grammar" is in fact the recovery of the original sense.

Lectio difficilior potior — "the more difficult reading is the stronger": between two readings the harder is the likelier original, since copyists tend to simplify an unfamiliar text — and Vitruvius's technical Latin was often unfamiliar.

Lectio facilior — the "easier" reading, frequently a later simplification or a fifteenth-century humanist "correction" that smoothed the grammar at the cost of authenticity.

Contaminatio — the mixing of readings from two or more manuscript families in a single copy (as in the Selestadiensis), producing a hybrid text that the editor must disentangle.

Crux desperationis (†) — the "cross of despair", placed in the text where a passage is so corrupt that it cannot be restored with certainty — a mark of editorial honesty rather than of failure.

The oldest codices and their history

The transmission of De *architectura* rests almost entirely on the work of Carolingian copyists. When, around the year 800, the cultural renaissance fostered by Charlemagne and his teachers — Alcuin of York, Theodulf of Orléans — promoted the systematic copying of ancient authors, Vitruvius's treatise was one of the technical texts that escaped oblivion. The essential testimony of the entire tradition dates from that period.

H · Codex Harleianus 2767

Harley MS 2767, copied in Caroline minuscule in the first quarter of the ninth century, is the oldest known surviving copy of De architectura. The British Library gives Cologne or Aachen as possible places of origin and treats the palace-scriptorium association as uncertain. Its documented medieval provenance includes St Pantaleon in Cologne. Two leaves are now in Oxford,

Bodleian Library, Rawlinson MS D. 893, ff. 135–136. The later history recorded by the catalog leads through the collections of Graevius, the Elector Palatine, Zamboni and the Harleys; it does not establish a discovery by Poggio at St Gall. Its authority is therefore assessed through its text and documented history, without making it the sole source of every surviving witness.

G · Codex Gudianus 69

Preserved in the Herzog August Bibliothek in Wolfenbüttel, it is the principal witness to the second lineage of the tradition. Although somewhat later than the Harleian, it occasionally transmits its own readings and valuable corrections not found in H, which is why modern editors systematically compare it. The famous divergence in *De arch.* 6.6.4 — the granaries with " solid " (according to H) or " raised " (according to G) floors — illustrates the usefulness of comparing both families.

Other ancient witnesses

Other early witnesses. The relations of the Leiden, Pithoeanus and Selestadiensis witnesses must be established within the sigla and argument of a particular edition. Krohn groups the Selestadiensis (S) with H, while placing the Gudianus witnesses E and G on the other side of the tradition. Contamination, correction and collateral descent require textual evidence. A hypothetical chain through lost manuscripts at Fulda or Reichenau should not be presented as a documented provenance of Harley MS 2767.

It is worth remembering, contrary to the common notion of Vitruvius being " rediscovered " during the Renaissance, that the treatise never completely fell out of use: it was known and cited by medieval scholars such as Alcuin, Einhard, Hugh of Saint Victor, Vincent of Beauvais, and Hildegard of Bingen. Poggio's discovery in 1416 did not rescue the text from oblivion, but rather returned its finest testimony to scholarly circulation.

Appendix · Conspectus of Greek Terms in De architectura

The following conspectus gathers the principal Greek terms employed by Vitruvius, with their roots, literal sense, Latin (Vitruvian) equivalent, architectural meaning, and the chief passages of De architectura in which each occurs. It complements Appendix N (Restitutio vocabulorum Graecorum), which records the manuscript corruptions and their restitution.

Table 8. *Conspectus of Greek terms in the De architectura*

Greek Term	Transliteration	Etymology (root)	Literal Meaning	Vitruvian Equivalent	Architectural Sense	Loci in De architectura
τάξις	*taxis*	τάσσω (tássō), to arrange	order, arrangement	*Ordinatio*	modular order according to a unit	1.2.2; 1.2.4
διάθεσις	*diathesis*	διατίθημι (diatíthēmi), to dispose	disposition, arrangement	*Dispositio*	intellectual conception and its representation	1.2.2; 1.2.3
εὐρυθμία	*eurythmia*	εὖ (eu), well + ῥυθμός (rhythmós)	good proportion, harmonious rhythm	*Eurythmia*	visual harmony perceived by the eye	1.2.3; 3.1.1; 6.2.1
συμμετρία	*symmetria*	σύν (syn), with + μέτρον (métron)	commensurability	*Symmetria*	modular proportion among the parts	1.2.4; 3.1.1–3.1.9; 5.6.7
οἰκονομία	*oikonomia*	οἶκος (oîkos), house + νόμος (nómos)	household management	*Distributio*	economic and functional distribution	1.2.9; 5.1.1; 6.8.1
τὸ πρέπον	*to prepon*	πρέπειν (prépein), to be fitting	what is fitting	*Decor*	propriety, cultural appropriateness	1.2.5–1.2.7; 4.1.6–4.1.12

Greek Term	Transliteration	Etymology (root)	Literal Meaning	Vitruvian Equivalent	Architectural Sense	Loci in De architectura
ἀναλογία	*analogia*	ἀνά (aná) + λόγος (lógos)	proportional relation	*Proportio*	mathematical proportion	3.1.1–3.1.9; 4.3.3
ἔντασις	*entasis*	ἐν (en) + τείνω (teínō), to stretch	tension, swelling	*Entasis*	convex curvature of the column shaft	3.3.13
ἀνάλημμα	*analemma*	ἀναλαμβάνω (analambánō), to take up	projection diagram	*Analemma*	geometric projection for the sundial	9.1.1; 9.7.1–9.7.7
ἰχνογραφία	*ichnographia*	ἴχνος (íchnos), footprint + γράφω	drawing of the footprint	*Ichnographia*	ground plan	1.2.2
ὀρθογραφία	*orthographia*	ὀρθός (orthós) + γράφω	upright drawing	*Orthographia*	elevation (front view)	1.2.2
σκηνογραφία	*scaenographia*	σκηνή (skēnḗ) + γράφω	scene drawing	*Scaenographia*	perspective view	1.2.2; 7.praef.11
σκιαθήρας	*skiatheras*	σκιά (skiá), shadow + θηράω (thēráō)	shadow-hunter	*Gnomon*	rod of the sundial	9.1.1; 9.7.1–9.7.7
μετόπη	*metope*	μετά (metá) + ὀπή (opḗ)	space between openings	*Metopa*	space between the triglyphs	4.2.2–4.2.4
λογεῖον	*logeion*	λόγος (lógos), speech	place of speech	*Pulpitum (in part)*	raised stage of the Greek theater	5.6.1; 5.7.2
θυμελικοί / σκηνικοί	*thymelikoi / skenikoi*	θυμέλη (altar) / σκηνή (scene)	of the thymele / of the scene	—	musicians and chorus / dramatic actors	5.7.2; 5.6.2; 5.7.1

Theses on Vitruvius

This chapter gathers, in concise form, the principal scholarly positions that underlie the present edition. They are offered as theses for discussion: where a statement rests on textual, archaeological, or philological evidence it is presented as such; where it belongs to the editor's interpretive proposal, it is expressly marked as the author's hypothesis and not as established consensus. The chapter is deliberately brief and may be expanded in subsequent editions.

1. A single complete witness, not the "first architect."

De architectura is not the earliest architecture ever written but the only complete treatise on the subject to survive from classical antiquity. Vitruvius's historical importance lies in this completeness and in the systematic ambition of his ten books, not in any claim to have founded the discipline. The Greek treatises of Hermogenes, Pytheos and others that Vitruvius cites as his sources are lost; what survives of the ancient theory of building survives largely through him, so the claim this edition defends is one of transmission and completeness, not of priority.

2. The triad is a system, not a checklist.

firmitas, *utilitas*, and *venustas* (De architectura 1.3.2) are neither optional nor separable. In Vitruvius's conception, beauty arises from, and is inseparable from, sound construction and fitness for use; the same proportional reasoning that makes a building stand also makes it pleasing. Read in this way the three terms are not a checklist to be satisfied in turn but a single requirement seen from three sides, and the later reception that treated them as separable departs from Vitruvius's own emphasis on their interdependence.

3. *symmetria* is modular commensurability, not modern symmetry.

Vitruvian *symmetria* (συμμετρία) denotes the proportional correspondence of the parts to one another and to the whole through a common module; it must not be read as the modern, post-eighteenth-century notion of bilateral or mirror symmetry. The confusion is consequential, for rendering *symmetria* as "symmetry" imports a modern visual idea of balance that the Latin does not carry and obscures the modular reasoning — the use of a common module (modulus) — on which the whole proportional system rests.

4. The homo bene figuratus is not the "Vitruvian Man."

Vitruvius (3.1) describes a well-proportioned human figure inscribed within circle and square as a canon of proportion; he does not give the celebrated phrase or image later associated with Leonardo. The Renaissance "Vitruvian Man" is an interpretive elaboration, not a quotation of the text. His concern is to derive the proportions of the temple from those of the well-formed body; the image of a single figure simultaneously inscribed in circle and square, with its famous shifting of centers, is Leonardo's graphic solution to a problem the text poses but does not itself resolve.

5. Pythagorean number-symbolism is the author's hypothesis.

Vitruvius names Pythagoras and the practice of composing precepts in "cubes" of 216 verses (6^3) in the preface to Book V; his use of number is technical. Any further reading of 216 or of the cube as a carrier of cosmic or sacred meaning is advanced here explicitly as the author's interpretive proposal, not as Vitruvius's stated intention. The distinction is methodological: the technical use of proportion is documented and defended philologically, whereas the symbolic resonance of particular numbers is offered as a separate and clearly labeled interpretive layer.

6. The transmission preserves collateral witnesses.

The text descends through a complex medieval manuscript tradition in which the Carolingian Harleianus 2767 (H) is a major witness and Gudianus 69 (G) preserves an important collateral line. The Latin in this edition follows Krohn (1912), checked against Rose (1899) and the Budé volumes. Greek technical terminology, sometimes corrupted or transliterated in transmission, is normalized in the present text according to the critical editions and discussed in Appendix N and the Conspectus of Greek Terms.

7. The Basilica at Fano is the one work Vitruvius claims — and a current test case.

The basilica at Fanum Fortunae is the building Vitruvius explicitly says he designed and supervised (5.1.6–10). On 19 January 2026 the Italian Ministry of Culture announced the identification of the remains in Piazza Andrea Costa as that basilica, and further archaeological investigation continued. Institutional identification, excavated evidence, the ancient measurements and modern

proportional reconstructions remain distinct kinds of evidence. Source: Ministero della Cultura, communication of 19 January 2026, https://cultura.gov.it/comunicato/28580.

8. The survival of a canon.

The afterlife of De architectura — from its Carolingian copying and humanist rediscovery to the editio princeps of 1486 and the treatises of the Renaissance — is itself part of its meaning: Vitruvius matters not only for what he records of Roman practice but for the canon of proportion and decorum that later ages built upon his text. The present edition is itself a moment in that reception: a bilingual critical text addressed to the architect-reader as much as to the philologist.

Appendix · Conspectus codicum (tabular)

The catalogue distinguishes the four witnesses grouped in Krohn's preface (1912, VIII), the additional shelfmarks in Rose's sigla list (1899, IX), and a later illustrated Oxford witness. Dates follow the named catalogue or edition. Ω is a reconstructed common exemplar, not a surviving codex; recentiores is a collective description, not a single manuscript.

Table 9. *Conspectus codicum: the principal manuscripts*

Sig.	Witness and repository	Date	Contents and editorial relation
H	London, British Library, Harley MS 2767	800–824	Oldest known surviving copy. Possible Cologne or Aachen origin remains uncertain. Wind diagram on f. 16v. Krohn groups H with S.
S	Sélestat, Bibliothèque Humaniste, MS 17 (formerly 1153 bis)	Late 10th c.	Selestadiensis; Scletstatensis in Rose. Krohn groups S with H. Distinct from the Parisian manuscripts.
E	Wolfenbüttel, Herzog August Bibliothek, Cod. Guelf. 132 Gud. lat.	10th c.	Vitruvian excerpts interspersed with Faventinus. Krohn groups E with G.
G	Wolfenbüttel, Herzog August Bibliothek, Cod. Guelf. 69 Gud. lat.	11th c.	Complete treatise. Krohn groups G with E, rather than making G a direct descendant of H.
L	Leiden, Universiteitsbibliotheek, Voss. lat. F. 88	10th c.	Shelfmark and date in Rose's sigla list, 1899, IX.
P	Paris, Bibliothèque nationale de France, Latin 10277	Early 10th c.	Pithoeanus in Rose's sigla list (IX). Uppercase P is distinct from lowercase p.
p	Paris, Bibliothèque nationale de France, Latin 7227	11th–12th c.	A separate Parisian witness in Rose's sigla list (IX); not the Pithoeanus.
c	London, British Library, Cotton MS Cleopatra D I, ff. 1–82	1000–1049	Preface f. 2v; ten books ff. 3r–82r. Distinct from Harley. No reading is transferred between them.
O	Oxford, Bodleian Library, Auct. F. 5. 7	Late 14th c.	A later Vitruvian witness cataloged as Italian (Bologna), not twelfth-century Canterbury.

Appendix · Comparative Conspectus of the Vitruvian Terminology

This table compares English and French terminology with the usage of this edition. The French entries are comparative glosses, not a verified list of quotations from a single Budé translator. The relevant Budé volumes are Book I by Philippe Fleury (1990), Book II by Louis Callebat with Pierre Gros and Catherine Jacquemard (1999), and Book III by Pierre Gros (1990). Granger and Perrault remain the other comparative references.

Table 10. *Comparative conspectus of the Vitruvian terminology across editions*

Vitruvian concept	Academic (Loeb–Granger)	French gloss	Classical (Perrault)	This edition
Firmitas	Durability	Solidité	Solidité	*Firmitas (solidity)*
Utilitas	Convenience	Commodité	Utilité	*Utilitas (function)*
Venustas	Beauty	Beauté	Beauté	*Venustas (beauty)*
Ordinatio	Setting / order	Ordre	Ordre	*Ordinatio (order)*
Dispositio	Arrangement	Disposition	Disposition	*Dispositio (disposition)*
Eurythmia	Eurythmy	Eurythmie	Eurythmie	*Eurythmia (eurythmy)*
Symmetria	Symmetry	Symétrie	Proportion	*Symmetria (commensurate proportion)*
Decor	Propriety	Bienséance	Bienséance	*Decor (decorum)*
Distributio	Economy	Économie	Distribution	*Distributio (distribution)*

Note on the terminology. Where the modern versions favor functional equivalents (Granger's "convenience" for *utilitas*) and the classic French versions adapt the terms (Perrault), this edition retains the Latin root term and adds a technical gloss that seeks to recover the architectural nuance. *symmetria* is treated as commensurate proportion rather than modern (mirror) "symmetry"; *decor* is kept as decorum, for its ethical-aesthetic charge of "what is fitting"; and *distributio* is distinguished from *dispositio*, since in Vitruvius it concerns the management of materials, costs and social context rather than spatial arrangement.

Appendix · Thematic Index of Mathematical Content

This index gathers the chief mathematical and proportional themes treated in the volume, by section, as a guide for the reader. No page numbers are given, since they depend on the final layout.

Table 11. *Thematic index of mathematical content*

Section / Chapter	Mathematical topic
Preliminary Study	Proportions of the human body; inscription in square and circle
The Vitruvian Man	Squaring the circle (geometrically insoluble with rule and compass)
The Golden Ratio and Architecture	The golden number (φ) in architectural proportion
Allegory of the Duplication of the Cube	Duplication of the cube (the Delian problem)
Book I.2	The six principles: taxis, *symmetria*, analogia
Book III.1	Proportions of the body; homo bene figuratus; head as 1/8 module
Book III (temple proportions)	Modular proportion (modulus, *symmetria*)
Book IX	Gnomonics and astronomy; the analemma and geometric projection
Section on the number 216	Pythagorean number-symbolism ($216 = 6^3$) — interpretive
Appendix B · The Golden Number: φ (phi)	φ, proportional and numerical series
Appendix F	Proportions of the orders; metrological equivalences
Appendix N	Restoration of the Greek mathematical vocabulary (analogia, *symmetria*)

Appendix · Glossarium Vitruvianum

A philological and technical dictionary of Vitruvius's fundamental terms. Each entry gives the Latin lemma, the English equivalent used uniformly throughout this edition, a brief philological note, the chief loci in De architectura, and, where instructive, parallels in other Latin authors (Cicero, Varro, Pliny) and cross-references. Its purpose is to guarantee terminological consistency, to forestall the false friends that have dogged earlier translations, and to justify the renderings adopted. It complements the existing Glossary, the Restitutio vocabulorum Graecorum (Appendix N) and the Conspectus of Greek Terms; it may be expanded in future editions towards a full lexicon.

Book I — principles, the architect, the city

Architectura **— architecture.** The discipline (scientia) that Vitruvius founds at 1.1.1 upon fabrica and ratiocinatio — practice and reasoning together. For the underlying distinction between ars and scientia cf. Cicero, De oratore 1.144. Cross-refs: fabrica, ratiocinatio.

Fabrica **— practice.** 1.1.1: the continued and habitual exercise of the hand upon the material; the executant side of the art, inseparable from its reasoning. Cross-ref: ratiocinatio.

Ratiocinatio **— reasoning.** 1.1.1: the power to expound and demonstrate by proportion what is wrought by skill; the theoretical side of architecture. Cf. the Ciceronian ratio. Cross-ref: fabrica.

Ordinatio (τάξις) **— modular ordering.** 1.2.2: the apt adjustment of the members of a work taken severally, and their arrangement for proportion as a whole, by a chosen unit (quantitas). A calque of Greek τάξις; cf. its military and philosophical use in Varro and Caesar. Cross-refs: modulus, *symmetria*.

Dispositio (διάθεσις) **— disposition.** 1.2.2: the fit placing of the parts and the elegant effect of the whole in its arrangement, realized in the three "ideas" — ichnographia, orthographia, scaenographia. Compare the rhetorical *dispositio* of Cicero, De oratore 1.142. Cross-refs: ichnographia, orthographia, scaenographia.

Eurythmia (εὐρυθμία) **— graceful proportion.** 1.2.3: the comely look that arises when the members answer one another in height, breadth and length — the visible grace that follows the right application of *symmetria*. A Hellenism;

cf. Pliny, Naturalis historia 34, on the canon of the sculptors. Cross-ref: *symmetria*.

Symmetria (συμμετρία) — **commensurability (modular proportion).** 1.2.4 and 3.1.1–3.1.9: the agreement of the parts among themselves and with the whole through a common module; never bilateral "symmetry" in the modern sense. The central mathematical principle of Vitruvian design, and the most frequently misunderstood term in the treatise; to render it "symmetry" distorts the whole system. Cf. the mathematical harmony of Cicero, De natura deorum 2.119. Cross-refs: *ordinatio*, modulus, analogia, homo bene figuratus.

Decor (τὸ πρέπον) — **propriety (decorum).** 1.2.5–1.2.7: the faultless appearance of a work composed of approved details with authority, governed by prescription (statio), usage (consuetudo) and nature (natura). The ethical-aesthetic sense of "what is fitting"; cf. Cicero, Orator 70–74, on decorum. Cross-ref: *distributio*.

Distributio (οἰκονομία) — **distribution (economy).** 1.2.8–1.2.9: the fit management of materials and site and the husbanding of expense — not spatial arrangement, which is *dispositio*. Cf. Cicero, De officiis 1.14, on oeconomia. Cross-ref: *dispositio*.

Firmitas — **solidity.** 1.3.2: structural soundness and durability; the first member of the triad. Cross-refs: *utilitas*, *venustas*.

Utilitas — **utility.** 1.3.2: fitness for use and convenient disposition; the second member of the triad.

Venustas — **beauty.** 1.3.2: grace and pleasing appearance; the third member of the triad. The three are not a checklist but a single requirement seen from three sides.

Modulus (rata pars) — **module.** The unit of measure from which all the proportions of a work are derived (commonly the lower diameter of the column). Cross-refs: *ordinatio*, *symmetria*.

Ichnographia (ἰχνογραφία) — **ground plan.** 1.2.2: the plan drawn "by the footprint" (ἴχνος). Cross-refs: orthographia, scaenographia.

Orthographia (ὀρθογραφία) — **elevation.** 1.2.2: the upright image of the front, drawn to scale.

***Scaenographia (σκηνογραφία)* — perspective view.** 1.2.2: the shaded drawing of front and receding sides, the lines answering to a center. Cf. 7.praef.11 on its origin in stage-painting.

***Salubritas* — healthiness (of a site).** 1.4: the choice of a wholesome region for a city — high ground, free of marsh and mist, with sound water; cf. 6.1 on climate and 6.6 on the villa.

Book II — materials and construction

***Caementum* — rubble-stone.** 2.7–2.8: the broken stone bedded in mortar — not modern "cement". A classic false friend. Cross-ref: opus caementicium.

***Opus caementicium* — Roman concrete.** 2.4: rubble bound with lime mortar and pozzolana, the structural core of Roman walls and vaults. Cross-refs: caementum, calx, pulvis Puteolanus.

***Pulvis Puteolanus* — pozzolana (volcanic ash).** 2.6: the powder of Puteoli that sets even under water. Cf. Pliny, Naturalis historia 35.166. Cross-ref: opus caementicium.

Calx — lime. 2.5: limestone burnt and slaked for mortar; its chemistry is discussed in the text.

***Later* — sun-dried brick.** 2.3: the unfired brick, of three Greek formats (the Lydian, the pentadoron and the tetradoron). Cross-ref: the Greek measures in the Conspectus.

***Fundamentum* — foundation.** 6.8: the bearing structure carried down to solid ground or to consolidated fill; cf. Varro, Res rusticae 1.11 on siting. Cross-ref: substructio.

***Materia* — timber, building material.** 2.9–2.10: the felling and seasoning of wood (abies, fir; robur, oak) according to season and grain.

Book III — the temple and its proportions

***Templum / aedes* — temple.** Books 3–4: aedes the built house of the god, templum properly the consecrated precinct marked out by the augur. Cross-ref: cella.

***Cella* — cella.** The inner chamber that houses the cult image. Cross-refs: pronaos, posticum.

***Columna* — column.** Books 3–4: with its capitulum (capital), basis (base) and epistylium (architrave); in the Doric, the triglyphus and metopa above. Cross-ref: intercolumnium.

***Entasis (ἔντασις)* — entasis.** 3.3.13: the slight convex swelling of the column-shaft, applied to correct the eye's impression of concavity — an optical refinement, not a structural one. Cross-ref: scamilli impares.

***Scamilli impares* — scamilli impares (the unequal risers).** 3.4.5: the graded blocks that give the stylobate a slight upward curvature against the illusion of sagging. A celebrated crux of interpretation; the term is kept in Latin. Cross-refs: entasis, stylobata.

***Homo bene figuratus (homo ad circulum et quadratum)* — the well-formed man inscribed in circle and square.** 3.1.1–3.1.9: the anthropometric canon (head one-eighth of the height, and so on) from which temple proportion is derived. Not the "Vitruvian Man", which is Leonardo's later graphic solution with its shifted centers. Cross-refs: *symmetria*, analogia.

***Analogia (ἀναλογία) / proportio* — proportion.** 3.1.1: the commensurate relation of measures; the Latin proportio renders the Greek analogia. Cross-ref: *symmetria*.

***Intercolumnium* — intercolumniation.** 3.3.1–3.3.10: the spacing of columns by module — pycnostyle, systyle, diastyle, araeostyle and the ideal eustyle. Cross-refs: columna, modulus.

***Stylobata* — stylobate.** 3.4.5: the platform course on which the columns stand. Cross-ref: scamilli impares.

Books IV–V — the orders, the theater and public buildings

***Triglyphus (τρίγλυφος)* — triglyph.** 4.3: the grooved block of the Doric frieze, representing in stone the projecting ends of the ceiling-beams. Cross-ref: metopa.

***Metopa (μετόπη)* — metope.** 4.2–4.3: the panel between two triglyphs; literally the space "between the openings" (ὀπά). Cross-ref: triglyphus.

***Mutulus* — mutule.** 4.2: the flat projecting block beneath the Doric cornice, recalling the rafter-ends; it carries the guttae. Cross-ref: gutta.

***Gutta* — guttae (drops).** 4.3: the small conical pendants set beneath the mutules and the regula, the petrified image of pegs.

***Echinus* — echinus.** 4.3: the cushion-like convex molding supporting the abacus of the capital.

***Voluta* — volute.** 3.5: the spiral scroll that characterizes the Ionic capital.

***Cavea* — cavea (auditorium).** 5.3–5.6: the banked seating of the theater, its wedges (cunei) divided by stairs and belts (praecinctiones).

***Orchestra (ὀρχήστρα)* — orchestra.** 5.6: the semicircular space between stage and seating; in the Greek theater for the chorus, at Rome reserved for the seats of senators.

***Scaena (σκηνή)* — stage-building.** 5.6: the architectural backdrop of the theater, with its three kinds of decoration (tragic, comic, satyric).

***Echea (ἠχεῖα)* — sounding-vessels.** 5.5: the bronze resonators tuned by harmonic ratios and set among the seats to reinforce the actors' voices — the most celebrated instance of Vitruvian acoustics.

***Basilica* — basilica.** 5.1: the roofed hall for business and law adjoining the forum; Vitruvius describes the one he himself built at Fanum Fortunae. Cross-ref: the Theses, no. 7.

Books IX–X — gnomonics, astronomy and machines

***Analemma (ἀνάλημμα)* — analemma.** 9.1 and 9.7: the geometric projection of the celestial sphere onto a plane, used to set out sundials. Cross-ref: gnomon.

***Gnomon (γνώμων)* — gnomon.** 9.7: the shadow-casting rod of the sundial, whose shadow (also σκιάθηρας) is read against the analemma. Cross-ref: analemma.

***Machina (μηχανή)* — machine.** 10.1: a connected structure of timbers possessing the greatest power for moving weights, working organikōs — by circular motion. Cross-refs: organum, cochlea.

***Cochlea (κοχλίας)* — the screw (of Archimedes).** 10.6: the water-raising screw turning within a cylinder.

Ballista / catapulta (καταπέλτης) **— ballista / catapult.** 10.10–10.12: the torsion engines of war, proportioned from the bore (foramen) that receives the sinew-springs.

Ergata **— windlass (capstan).** 10.2: the upright winch turned by hand-spikes for hauling and lifting. Cross-ref: tympanum.

Tympanum **— tread-drum.** 10.4–10.5: the great wheel or drum, trodden or turned to raise water and weights.

Appendix · Mensurae et termini technici: Roman units of measurement and key technical terms

A concise reference for the reader, and in particular for the practising architect. Roman measures are approximate; the Roman foot (pes) is here taken as c. 296 mm. Every proportional statement in Vitruvius is ultimately reducible to the module (modulus), normally the lower diameter or the radius of the column.

Linear measures (mensurae)

digitus (δάκτυλος, finger). 1/16 pes, c. 18.5 mm — the smallest unit and the basis of subdivision.

palmus (παλαιστή, palm). 4 digiti, 1/4 pes, c. 74 mm.
pes (πούς, Roman foot). 16 digiti, c. 296 mm — the fundamental unit.
palmipes. 1¼ pes (5 palmi), c. 370 mm.
cubitus (πῆχυς, cubit). 1½ pes (6 palmi, 24 digiti), c. 444 mm.
gradus (step). 2½ pes, c. 740 mm.
passus (pace). 5 pes, c. 1.48 m.
pertica / decempeda (rod). 10 pes, c. 2.96 m.
actus. 120 pes, c. 35.5 m.
stadium (στάδιον). 625 pes, c. 185 m.
mille passus (Roman mile). 5 000 pes (1 000 passus), c. 1.48 km.
Vitruvius derives these measures from the proportions of the human body (3.1.5–8): both the Greek "perfect number" (ten, the dáktyloi of the two hands) and the Roman "complete number" (sixteen) are grounded in the figure of the well-formed man.

Key technical terms (termini)

modulus (module). The unit governing the dimensions of an order, normally the lower diameter or the radius of the column, from which every member is derived; Greek ἐμβατήρ (embatḕr).

diameter. The lower diameter of the column shaft, the reference dimension of the order.

***symmetria*.** Commensurability — the proportional agreement of every part with a fixed module (rendered "commensurability" throughout this edition); Greek συμμετρία.

analogia (ἀναλογία). Proportion, the ratio underlying *symmetria*.

intercolumnium. The clear span between two columns, classed by Vitruvius as pycnostyle (1½ diameters), systyle (2), eustyle (2¼, his preferred), diastyle (3) and araeostyle (more than 3): 3.3.

entasis (ἔντασις). The slight convex swelling of the shaft that corrects the eye's tendency to read straight sides as concave: 3.3.13.

scamilli impares. The "unequal stools" or sub-plinths producing a slight upward curvature of the stylobate as an optical correction: 3.4.5.

stylobata (stylobate). The continuous platform on which a colonnade stands; crepido / crepidoma, its stepped base.

ratio (λόγος). Reasoned method and calculation, paired with fabrica (manual practice) in 1.1.1.

***ordinatio*, *dispositio*, *eurythmia*, *symmetria*, *decor*, *distributio*.** The six fundamentals of architecture (1.2); see Table 1.

Appendix · Conspectus rerum architectonicarum: a thematic index of architectural concepts

References are to the canonical division book.chapter(.section), which is identical in all modern editions (Rose, Krohn, Granger, Budé, Rowland–Howe) and therefore independent of the pagination of the present volume.

I. Fundamentals and theory

The education of the architect. 1.1; fabrica and ratiocinatio, 1.1.1

The six principles (*ordinatio*, *dispositio*, *eurythmia*, *symmetria*, *decor*, *distributio*). 1.2

***firmitas*, *utilitas*, *venustas* (the triad).** 1.3.2

Proportion (analogia) and the human body. 3.1

II. The orders and the temple

The parts of architecture (aedificatio, gnomonice, machinatio). 1.3.1

Temple plans (in antis, prostyle, amphiprostyle, peripteral, pseudodipteral, dipteral, hypaethral). 3.2

Intercolumniation (pycnostyle, systyle, eustyle, diastyle, araeostyle). 3.3

The Ionic order and the column. 3.4–3.5

The Corinthian capital (origin and proportions). 4.1

The Doric order. 4.3

The Tuscan temple. 4.7

Optical corrections (entasis, scamilli impares, angular adjustment). 3.3–3.5; 6.2

III. Materials and construction (Book II)

Origin of architecture; the primitive hut. 2.1

Bricks. 2.3

Sand, lime, pozzolana. 2.4–2.6

Stone and masonry (opus reticulatum, incertum). 2.7–2.8

Timber (fir, abies). 2.9–2.10

IV. Public buildings (Book V)

The forum and the basilica. 5.1

Vitruvius' own basilica at Fano. 5.1.6–5.1.10
The theater: plan, acoustics and the harmonic vases. 5.3–5.8
Baths (balneae). 5.10
The palaestra. 5.11
Harbours and breakwaters. 5.12
V. Private buildings (Book VI)
Climate and the design of houses. 6.1
The Roman house (atrium, tablinum, cavaedium). 6.3
Proportions of rooms. 6.3–6.5
The Greek house (andronitis, gynaeconitis, peristyle). 6.7
VI. Finishing and painting (Book VII)
Pavements. 7.1
Stucco and plaster. 7.3
The "decline" of wall painting (the famous polemic). 7.5
Pigments and colors. 7.7–7.14
VII. Water (Book VIII)
Finding and testing water. 8.1
Rainwater and rivers. 8.2
Leveling instruments (chorobates, dioptra, libra aquaria). 8.5
Aqueducts; lead and clay pipes. 8.6
VIII. Gnomonics and astronomy (Book IX)
The heavens, the zodiac and the planets. 9.1–9.6
The analemma. 9.7
Sundials and water-clocks (clepsydra). 9.8
IX. Machines (Book X)
Definition of machina and organon. 10.1
Lifting machines and cranes. 10.2–10.3
Water-raising devices (tympanum, Archimedes' screw, ctesibian pump). 10.4–10.7
The water-organ (hydraulis). 10.8
The hodometer. 10.9
Siege engines (ballistae, catapultae, testudines, towers). 10.10–10.16

Excursus · The Querelle of Proportion: Vitruvius, Palladio, and Perrault

No question runs deeper through the reception of the *De architectura* than this one: are the proportions that Vitruvius records grounded in nature, and therefore binding upon every architect in every age, or are they conventions — beautiful because they are familiar, authoritative because they are old? On the answer hangs the whole status of Vitruvius' canon. If proportion is a law of nature, the treatise is a body of science; if it is custom, the treatise is a record of taste. The debate came to a head in seventeenth-century France, but its terms are already latent in Vitruvius himself.

Vitruvius grounds beauty in *symmetria* — the commensurability of every part with a fixed module — and derives that commensurability from the proportions of the well-formed human body (3.1) and, by analogy, from the consonances of music (5.4). For him the orders are not arbitrary: the Doric carries the proportions of a man, the Ionic those of a matron, the Corinthian those of a maiden (4.1). Proportion is thus a natural and quasi-mathematical fact, discovered rather than invented.

Andrea Palladio (1508–1580) inherited this conviction and gave it its most influential modern form. In the *I quattro libri dell'architettura* (Venice, 1570) he prescribes seven "most beautiful" room-shapes whose ratios — the square, the diagonal of the square, and the simple musical proportions 2:3, 3:4, 3:5 — echo the harmonic intervals. For Palladio, as for Alberti before him (*De re aedificatoria*, 1452), the architect who follows these ratios does not impose a private preference but obeys a harmony written into the cosmos. This is the doctrine that Rudolf Wittkower named the "harmonic" or "musical" theory of proportion.

Claude Perrault (1613–1688), physician, anatomist and member of the Académie des Sciences, also participated in the Louvre colonnade project. His French translation, Les dix livres d'architecture de Vitruve (Paris, 1673; revised 1684), brought together commentary and engraved illustrations. His criticism of proportional authority must be read in the context of that close engagement with the treatise.

In the preface to that translation, and at length in the *Ordonnance des cinq espèces de colonnes selon la méthode des anciens* (Paris, 1683), Perrault distinguished two kinds of architectural beauty. *Positive beauty* (*beauté positive*) rests on causes that convince everyone — richness of material, precision and cleanness of execution, bilateral regularity, and magnitude. *Arbitrary beauty* (*beauté arbitraire*), by contrast, comprises the proportions of the orders; these please us, Perrault argued, not because reason or nature compels them but because custom and association have accustomed the eye to them. There is no single ratio that nature dictates: the proof, he observed, is that the proportions admired by the ancients themselves vary from building to building and from author to author.

From this premise Perrault drew a practical method as radical as his theory. Rather than seek the one true proportion, he proposed a *mean* or averaged system, derived by reconciling the divergent measures of the most admired ancient buildings into a simple, memorable rule. Proportion, for Perrault, was to be regulated by reasonable convention — by the architect's judgment and the consensus of taste — not deduced from a law of nature.

The challenge did not go unanswered. François Blondel (1618–1686), first director of the Académie Royale d'Architecture, defended the older view in his *Cours d'architecture* (1675–1683), insisting that proportion possesses an objective foundation in number, in music, and in nature, exactly as Vitruvius had taught. The exchange between Perrault and Blondel became the architectural front of the wider *querelle des anciens et des modernes*: Blondel for the ancients and the absolute, Perrault for the moderns and the conventional.

The quarrel was never settled, and that is its importance. It exposed, once and for all, that the Vitruvian canon can be read in two incompatible ways, and that a reader must choose. Later theory has oscillated between the poles. The harmonic tradition revived in the proportional systems of the nineteenth century and in Le Corbusier's *Modulor* (1948), which sought once more to anchor design in the measures of the body; the conventionalist tradition fed the historicism and, ultimately, the proportional skepticism of much modern practice.

For the present edition the controversy carries a precise consequence. When Vitruvius states that a column shall be of such-and-such a diameter, or that the

eustyle intercolumniation shall measure two and a quarter diameters, the modern reader is entitled to ask whether such figures record a discovered law or a codified habit. This edition takes no side in the metaphysical question. It renders the proportions faithfully, as Vitruvius gives them, and leaves to the architect — as Perrault would have wished, and as Palladio would have resisted — the freedom to regard them either as nature's rule or as the accumulated wisdom of a tradition. The text is law for those who read it as law, and counsel for those who read it as counsel.

Select references. Andrea Palladio, *I quattro libri dell'architettura* (Venice, 1570); Claude Perrault, *Ordonnance des cinq espèces de colonnes* (Paris, 1683), and *Les dix livres d'architecture de Vitruve* (Paris, 1673); François Blondel, *Cours d'architecture* (Paris, 1675–1683); Rudolf Wittkower, *Architectural Principles in the Age of Humanism* (London, 1949); Alberto Pérez-Gómez, *Architecture and the Crisis of Modern Science* (Cambridge, MA, 1983); Joseph Rykwert, *The Dancing Column* (Cambridge, MA, 1996).

Supplementary tables

The following tables gather, as a reference tool for the reader and the architect, the principal classifications and equivalences of Vitruvian doctrine (the orders, the intercolumniations, the temple plans, the disciplines of the architect and the ancient measures), together with a survey of the building and literary context of the age. The references are to the books and chapters of the De architectura.

Table 12. The disciplines of the ideal architect (De architectura 1.1.3–1.1.10)

Discipline	Latin term	Purpose according to Vitruvius
Letters / grammar	*litterae*	To write clearly and to retain the memory of doctrine
Drawing	*graphis*	To represent plans, elevations and perspectives
Geometry	*geometria*	Rule and compass; layout and proportion
Arithmetic	*arithmetica*	Reckoning of costs and measures; theory of number

Discipline	Latin term	Purpose according to Vitruvius
Optics	*optica*	Correct admission of light (joined to geometry)
History	*historia*	To explain the origin and meaning of ornament
Philosophy	*philosophia*	Loftiness of mind, physics and the architect's integrity
Music	*musica*	Theory of harmony; tuning of engines and acoustics
Medicine	*medicina*	Healthiness of sites (climate, waters, orientation)
Law	*iuris responsa*	Servitudes, waters, party walls and contracts
Astronomy	*caeli ratio*	Orientation, gnomonics and sundials

Note. Vitruvius requires of the architect an encyclopedic learning (encyclios disciplina, 1.1.12), uniting fabrica (practice) and ratiocinatio (reasoning).

Table 13. The architectural orders (De architectura, Books III–IV)

Order	Slenderness (diam.)*	Capital	Shaft	Base	Ornament
Tuscan	7	Abacus and echinus	Plain	Torus on plinth	Very low
Doric	7	Abacus and echinus; triglyphs	20 sharp-edged flutes	No base	Medium
Ionic	8; 8½; 9½; 10*	Volutes	24 filleted flutes	Attic-Ionic	High
Corinthian	9½	Acanthus leaves	24 filleted flutes	Attic-Ionic	Very high

Note. *Slenderness means column height divided by lower shaft diameter. For Ionic columns, III.3.10 gives 8 diameters in the araeostyle, 8½ in the diastyle, 9½ in the systyle and eustyle, and 10 in the pycnostyle. The Corinthian comparison retains the relationship discussed in IV.1.1, where the taller capital is distinguished from the Ionic proportions; the Book IV data remain outside the present textual review.

Table 14. The intercolumniations (De architectura 3.3.1–3.3.6)

Type	Span (diam.)	Character and use	Vitruvius's assessment
Pycnostyle	1½	Columns very close; closed aspect	Little recommended
Systyle	2	Columns close together	Criticized for obstructed access (3.3.3)
Eustyle	2¼	The best balanced	The preferred type (3.3.6)
Diastyle	3	Wider spacing; monumental	Risk of long architraves
Araeostyle	more than 3	Widely spaced; wooden architraves	Proper to the Tuscan order

Note. Measurements in lower diameters. In the eustyle the central span is 3 diameters (3.3.6).

Table 15. Types of temple plan (De architectura 3.2)

Type	Greek term	Arrangement of the columns	Remarks
In antis	*ναὸς ἐν παραστάσιν*	Two columns between the antae of the pronaos	The simplest (3.2.2)
Prostyle	*prostylos*	Portico of columns at the front only	3.2.3
Amphiprostyle	*amphiprostylos*	Porticoes at front and rear	3.2.4
Peripteral	*peripteros*	Colonnade around the whole perimeter	The balanced model (3.2.5)
Pseudodipteral	*pseudodipteros*	One perimeter row; clearance = two intercolumniations plus one lower diameter	Ascribed to Hermogenes (3.2.6)
Dipteral	*dipteros*	Double perimeter row of columns	Great monumentality (3.2.7)
Hypaethral	*hypaethros*	Decastyle; center unroofed; interior columns in two tiers	Rare; special cults (3.2.8)

Note. The classification rests on the arrangement of the columns relative to the cella. The pseudodipteral is ascribed to Hermogenes of Alabanda.

Roman units are consolidated in Table 5; metric conversions are approximate.

Note. The Roman pes is here taken as 0.2957 m (the most widely accepted value, between 29.5 and 29.7 cm). The module of the orders equals the lower diameter of the shaft.

Table 16. Principal Greek measures

Unit	Equivalence	Approx. value (m)	Notes
daktylos	1/16 pous	0.0193	Finger
palaiste	4 daktyloi	0.077	Palm
pous	16 daktyloi	0.308–0.320	Greek foot (varies by region)
pechys	1½ pous	0.462–0.480	Cubit
orgyia	6 pous	1.85–1.92	Fathom
plethron	100 pous	30.8–32	Plots and squares
stadion	600 pous	185–192	Distances

Note. The Greek foot is somewhat larger than the Roman. Hermogenes, admired by Vitruvius, used the Ionic-Attic foot.

Table 17. Egyptian measures and the royal cubit

Unit	Subdivision	Approx. value (m)	Notes
djeba	finger	0.0187	Smallest unit
shesep	4 fingers	0.075	Palm
common cubit	6 palms (24 fingers)	0.45	Everyday use
royal cubit (meh niswt)	7 palms (28 fingers)	0.5236	Sacred and architectural unit

Note. The royal cubit was divided into 28 parts (7 palms × 4 fingers). Standard value ≈ 0.523–0.525 m; some studies propose an ideal of 0.5236 m. Vitruvius knew and admired Egyptian metrology but used his own module.

Table 18. Buildings contemporary with Vitruvius (Augustan age)

Building	Approx. date	Type	Remarks
Basilica of Fano	27–20 BCE	Basilica	Described by Vitruvius (5.1.6): 120 × 60 feet; his only documented work
Pantheon of Agrippa (orig.)	27–25 BCE	Temple	Later rebuilt by Hadrian

Building	Approx. date	Type	Remarks
Temple of Mars Ultor	2 BCE	Corinthian temple	Forum of Augustus
Theater of Marcellus	13–11 BCE	Theater	
Ara Pacis Augustae	13–9 BCE	Monumental altar	
Temple of Apollo Sosianus	34–20 BCE	Corinthian temple	Marble; Corinthian order at Rome

Note. The dimensions of the Fano basilica come from Vitruvius himself (5.1.6); the other works are dated by Augustan chronology.

Table 19. Technical treatises and literature contemporary with Vitruvius

Author	Work	Date	Condition
Vitruvius	*De architectura*	27–23 BCE	Preserved in full
Varro	*De re rustica*	37 BCE	Preserved
Cicero	*De oratore; De re publica*	55–43 BCE	Preserved
Lucretius	*De rerum natura*	c. 55 BCE	Preserved
Virgil	*Aeneis; Georgica*	29–19 BCE	Preserved
Livy	*Ab urbe condita*	27 BCE–AD 9	Partial
Frontinus	*De aquaeductu*	c. AD 97	Preserved (later)
Pliny the Elder	*Naturalis historia*	AD 77	Preserved; cites Vitruvius
Philo of Byzantium	*Mechanica*	3rd c. BC	Fragments; source for Vitruvius
Ctesibius	*(mechanics and hydraulics)*	3rd c. BC	Lost; cited by Vitruvius

Table 20. Buildings of the De architectura: mentioned vs. preserved

Building	De architectura	State of preservation
Tower of the Winds (Athens), by Andronicus	1.6.4	Preserved almost intact
Temple of the 'Three Fortunes' (Rome)	3.2.2	Lost
Temple of Diana at Ephesus	3.2.7; 7 pr. 16	Lost; fragments (Ephesus / British Museum)
Temple of Diana at Magnesia (Hermogenes)	3.2.6; 7 pr. 12	Excavated ruins

Building	De architectura	State of preservation
Mausoleum at Halicarnassus	2.8.11; 7 pr. 12	Lost; fragments (British Museum)
Basilica at Fano (Vitruvius's own work)	5.1.6–10	Lost; foundations found (2026)
Aqueducts of Rome (Appia, Marcia)	cf. 8.6	Arches and specus preserved
Greek house (andronitis/gynaeconitis)	6.7	Type documented (Delos, Priene)

Note. De architectura is the only treatise on architecture from classical Antiquity preserved in full; many of its Greek sources are lost.

Appendix S · Comparative Archaeological Apparatus

This appendix sets Vitruvius's prescriptions against the known archaeological, epigraphic and material evidence, so as to give the reader — and the architect in particular — a concrete measure of how far the text corresponds to Roman building practice. The "degree of correspondence" is a qualitative assessment, not a measurement.

1. Materials and building techniques (Book II)

Table 21. Comparative archaeological apparatus 1

Passage	Vitruvian doctrine	Material evidence	Correspondence
2.4–2.6	*Opus caementicium and pulvis Puteolanus*	Roman concrete in the Pantheon, the Basilica of Maxentius and aqueducts	Excellent
2.3	*Bricks (lydion, pentadoron, tetradoron)*	Dimensions confirmed at Ostia, Pompeii and Herculaneum	Very high
2.8	*Opus reticulatum and incertum*	Common in Republican and early Imperial work	High

Note. The pozzolana of Puteoli (pulvis Puteolanus) made possible the wide vaults of Roman concrete.

2. Temples and orders (Books III–IV)

Table 22. Comparative archaeological apparatus 2

Passage	Doctrine	Material evidence	Correspondence
3.1	Proportions of the body (homo bene figuratus)	Augustan temples (Mars Ultor, Maison Carrée)	High (ideal canon)
3.3.6	Eustyle, the ideal intercolumniation (2¼ diam.)	Temple of Mars Ultor; Maison Carrée	Very high

Passage	Doctrine	Material evidence	Correspondence
3.3.13	Entasis (optical correction of the shaft)	Columns of the Pantheon and Pompeian temples	Excellent
3.4.5	Scamilli impares (disputed stylobate adjustment)	Curved stylobates in ancient temple construction; no single surviving feature securely identifies the scamilli	Interpretation disputed
4.1	Origin and proportions of the Corinthian capital	Numerous examples in Rome and the provinces	Excellent

Note. The bodily proportions form an ideal canon. Surviving buildings offer comparisons for proportions, profiles, and optical refinements, but the degree of correspondence varies by monument and does not establish a universal building rule.

3. Public buildings (Book V)

Table 23. Comparative archaeological apparatus 3

Passage	Doctrine	Material evidence	Correspondence
5.1.6–10	Vitruvius's account of the basilica, including a central covered space of 120 × 60 Roman feet	Piazza Andrea Costa, Fano: official identification announced on 19 January 2026	Excavation and detailed architectural comparison remain under investigation
5.3–5.8	Roman theater (cavea, orchestra, scaena)	Theaters of Pompeii, Orange, Leptis Magna, Sabratha	Excellent
5.5	Acoustic vessels (echeia; ἠχεῖα)	Niches and jars in some theaters (disputed evidence)	Partial

Note. On the Fano basilica see the specific note below. For the echea, the material evidence is scant and disputed.

4. Private housing (Book VI)

Table 24. Comparative archaeological apparatus 4

Passage	Doctrine	Material evidence	Correspondence
6.3	Roman house (atrium, tablinum, peristyle)	Houses of Pompeii and Herculaneum (Faun, Vettii)	Very high
6.7	Greek house (andronitis and gynaikonitis)	Olynthos, Delos and Priene	High

Note. Vitruvius's Roman house closely matches the Pompeian plans; the Greek house reflects the Hellenistic model.

5. Hydraulic engineering and machines (Books VIII and X)

Table 25. Comparative archaeological apparatus 5

Passage	Doctrine	Material evidence	Correspondence
8.5	Leveling instruments (chorobates, dioptra)	Gradients measured in aqueducts; instrument finds	High
8.6	Aqueducts, castella, pipework	Pont du Gard, Segovia aqueduct, Aqua Claudia	Excellent
10.6	Archimedes screw (cochlea)	Reliefs and finds in Roman mines	Confirmed
10.10–16	Ballista, catapult, siege testudo	Trajan's Column; reliefs and material remains	High

Note. Vitruvius's hydraulic metrology is remarkably accurate; for the war machines, the text is borne out by iconography and remains.

The Fano basilica: the case of direct verification

The basilica of Fanum Fortunae is the only building Vitruvius claims to have designed and supervised himself (conlocavi curavique faciendam, 5.1.6), and so it offers an exceptional test of the text against material remains. In January 2026 the Italian authorities (the Marche Region, the Municipality of Fano and the Soprintendenza) announced the identification, in Piazza Andrea Costa at Fano, of the remains of a monumental basilica attributed to this work. The features made public correspond strikingly to the Vitruvian description: a rectangular

plan with a colonnade of eight columns on the long sides and four on the short ones — exactly the arrangement of 5.1.7 — and shafts of about five Roman feet in diameter, in keeping with the crassitudinibus quinum of the text, dated to the Augustan age. It should be stressed, however, that the excavation is still in progress and that the authorities themselves caution that it remains to be seen how much survives; the dimensions and other particular features should therefore be taken as preliminary results, not as settled data.

Note. This appendix reflects the state of research as of 2026 and should be updated with new findings.

EPILOGUE

The figure of Vitruvius presents a paradox characteristic of many foundational authors: while we know remarkably little about his life, his *De architectura* has shaped architectural thought for more than two thousand years. This disproportion between the obscurity of the author and the enduring legacy of his work is not accidental: it is the very nature of foundational texts, which survive precisely because they cease to belong to their author and become the heritage of their readers.

Vitruvius's treatise has come down to us mutilated, deprived of its original figures. The illustrations that accompanied the text — the diagrams of the orders, the plans of the temples, the layouts of the machines — were lost somewhere in the chain of copies, and the Renaissance had to reconstruct them with ruler and compass from the words alone. This loss, far from impoverishing the work, made it fruitful: it forced Alberti, Cesariano, Palladio, and Barbaro to read Vitruvius with pencil in hand, transforming philology into a project and commentary into architecture.

If this journey through the Ten Books teaches us anything, it is that the triad Vitruvius enunciated — *firmitas*, *utilitas*, *venustas* — does not describe three separable qualities, but rather three facets of the same measure. Solidity without utility is premature ruin; utility without beauty, mere construction; beauty without solidity, ephemeral scenery. For Vitruvius, architecture begins where the three converge, and this conviction — that number, matter, and form obey a single reason — remains the core of any architectural theory worthy of the name.

This edition has sought to uphold a twofold commitment: historical and philological rigor, on the one hand, and openness to the symbolic dimension of the treatise, on the other, always maintaining the distinction between what the sources allow us to affirm and what belongs to the author's interpretation. Perhaps this is the most faithful way to honor Vitruvius, who wrote convinced that the architect should master both the square and astronomy, construction and reasoning, the hand and number.

A debt and a hope remain. Every edition of a classical work is provisional: further collation, closer translation and a more precise apparatus can always

deepen our understanding. This English edition seeks to extend the conversation between classical philology and architectural research, bringing students, architects and scholars into renewed contact with Vitruvius's surviving voice. As he observes, the gifts of fortune are quickly lost, whereas knowledge, once rooted in the mind, endures until the end of life.

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Published in Buenos Aires

At Sophia Lux Publishing

Franklin 2054, Buenos Aires (CABA), Argentina — Tel: 011 45847071

First edition, 2026

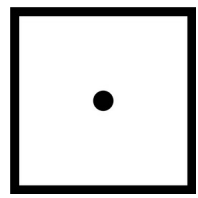


Figure 23. Contemporary editorial geometric emblem: a central point within a square. From the illustrative material supplied for this edition (2026); used as a concluding symbol, not as an ancient document or a manuscript illustration.

Colophon

Hoc volumen, Vitruvii Pollionis De architectura libri decem, studio ac diligentia editoris paratum, Bonaeropoli ab officina editoria Sophia Lux anno MMXXVI editum est.

In hac editione textus Latinus, interpretatio Anglica et commentarius historicus atque architectonicus distincte disponuntur.

Editum Bonaeropoli, anno MMXXVI.