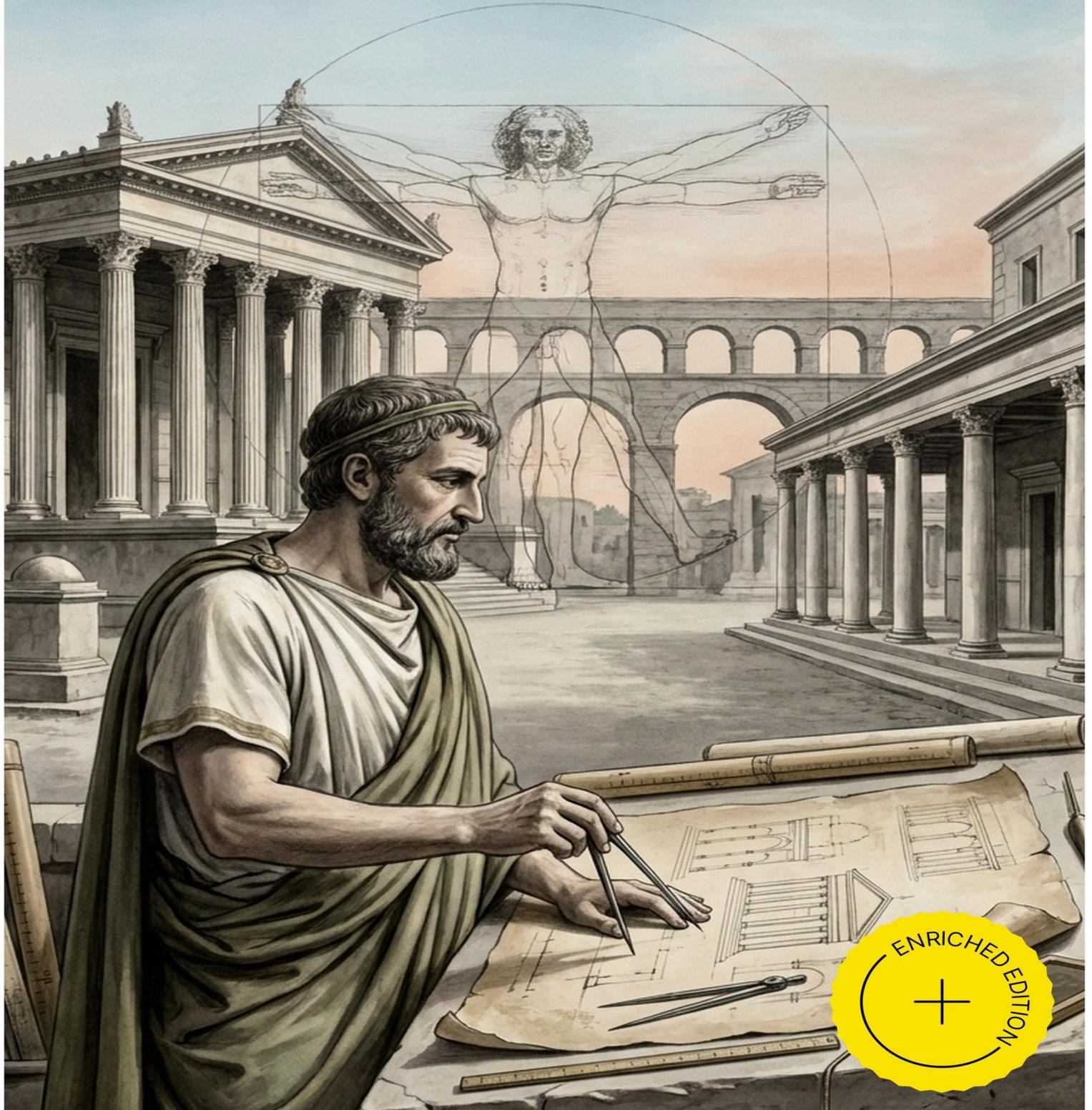
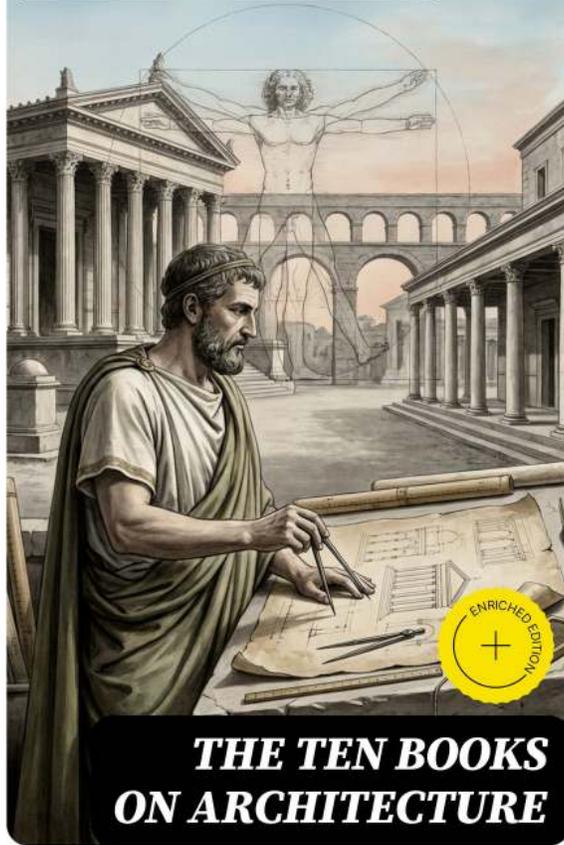


VITRUVIUS POLLIO



**THE TEN BOOKS
ON ARCHITECTURE**

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ON ARCHITECTURE**

Vitruvius Pollio

The Ten Books on Architecture

Enriched edition.

Introduction, Studies and Commentaries by Trevor Grimm

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Introduction

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At the hinge of Rome's transformation, a practical engineer surveys stones, shadows, winds, and streams, and insists that a city must rise where geometry guides the hand, craft disciplines the materials, climate instructs the plan, and public purpose governs every decision from foundation to cornice, linking measured bodies to measured spaces so that what is built can endure, serve, and delight without waste.

The Ten Books on Architecture, composed by Marcus Vitruvius Pollio in the late first century BCE and dedicated to Augustus, stands as the sole complete architectural treatise to survive from classical antiquity. Known in Latin as *De architectura*, it assembles a comprehensive program of theory and practice for designing, building, and maintaining the works of a civilized state. Its classic status rests on more than age; it offers an organized account of architecture's aims and methods that later eras repeatedly rediscovered. While grounded in Roman experience and Greek learning, it frames problems—of proportion, durability, and usefulness—that continue to shape how we judge the built world.

Vitruvius was a Roman architect and engineer writing at the moment when republican institutions were giving way to imperial administration. He presents himself as a technician addressing an emperor, but his purpose stretches beyond patronage: to codify reliable principles from scattered craft traditions and learned sources. He draws on mathematical reasoning, practical observation, and examples from Greek predecessors to argue that architecture belongs among the liberal arts. The author's vantage point is pragmatic yet humane. He is concerned with the education of the architect, with the ethics of professional duty, and with the idea that good building benefits civic life as a whole.

Arranged in ten books, the treatise proceeds from foundations to projections of machines. It describes the training an architect should receive; evaluates materials such as timber, stone, lime, and volcanic ash; sets out the classical orders and the planning of temples; discusses civic works including theaters and basilicas; examines private houses and urban settings; explains water supply and sanitation; treats the measurement of time and the design of sundials; and concludes with mechanics and machines. The result is neither a mere manual nor a philosophical tract, but a disciplined survey of the knowledge an architect must command to serve society.

Beyond its technical content, *De architectura* has a distinct literary character. Vitruvius writes in the tradition of Roman didactic prose, opening books with

reflective prefaces, situating lessons within broader cultural narratives, and organizing material through definitions, categories, and carefully chosen examples. He aims to persuade as well as instruct, joining claims from geometry with appeals to experience. Stories and historical references are deployed to reinforce principles, not to decorate them. This rhetorical texture made the treatise legible to readers across disciplines, allowing it to function as a gateway between scholarship and craft and to claim architecture's place among learned pursuits.

Several themes give the work its enduring profile. It links architectural proportion to mathematical harmony and to the perceived order of nature, casting design as an act of measured correspondence. It defines the architect's task as balancing strength, utility, and beauty so that a building stands firmly, serves its purpose, and pleases the eye. It stresses the importance of site, climate, and orientation, urging adaptation rather than formula. And it insists that the architect be broadly educated, conversant with geometry, music, medicine, and law, because building touches human health, social life, and public rituals as much as technical execution.

After antiquity, the treatise persisted in manuscript circulation and was reanimated by humanist scholarship. Its rediscovery and translation helped to reframe architecture during the Renaissance as a discipline grounded in texts as well as buildings. Artists and architects consulted Vitruvius for guidance on proportion, orders, and the responsibilities of the profession. Leonardo da Vinci famously engaged with Vitruvius's account of human proportions, integrating it into a drawing that became emblematic of measured harmony. The treatise informed the theoretical writings of figures such as Leon Battista Alberti and shaped the vocabulary that later makers used to interpret ancient remains and to design anew.

Through early modern Europe, Vitruvius served as a common reference for builders, engineers, and scholars. His classifications of building parts and types, his descriptions of temples and theaters, and his emphasis on rational planning influenced civic architecture as well as domestic design. Academies and guilds alike absorbed his precepts, and treatises repeatedly echoed his themes when setting standards for proportion and ornament. While later practitioners revised and sometimes contested his prescriptions, the dialogue ran through him: he provided a baseline against which innovations could be measured. Even where construction methods diverged, his arguments for disciplined reasoning retained authority.

One reason for the book's longevity is the breadth of its intellectual map. Vitruvius treats architecture as a synthesis of arts and sciences, grounded in arithmetic and geometry, informed by music's ratios in acoustics, and attentive to the body's measure in space. He explains how to judge materials and how to inspect sites, but also how to coordinate specialists and assess risks. He values both rules and exceptions, allowing experience to refine precept. In this synthesis, the architect emerges as a mediator: able to translate abstract

reasoning into construction, and to translate local conditions into clear, humane decisions.

De architectura also serves as a window onto Roman technologies and environmental knowledge. Vitruvius describes concrete made with volcanic ash, discusses timber species and stone selection, explains surveying and leveling instruments, and outlines water-supply systems from sources to distribution. He records methods for constructing theaters suited to acoustics and for designing harbors that withstand the sea. In his book on machines, he catalogs hoists, pumps, and defensive engines. Much of this information corroborates archaeological evidence and illustrates how Roman practice combined empirical testing with inherited theory, leaving a record not only of monuments but of the procedures that made them possible.

Reading Vitruvius today, one hears a voice that addresses an ancient ruler yet appeals to any careful reader who values rigor joined to public purpose. The style can be austere, the terminology specialized, and the examples drawn from a world whose materials and customs differ from ours. Nevertheless, the treatise rewards patience with clarity: categories sharpen perception; methods prompt verification; and digressions illuminate how knowledge travels between disciplines. As a document of technical culture, it invites comparison with modern codes and standards, while reminding us that such prescriptions arise from moral choices about safety, comfort, and collective life.

The *Ten Books on Architecture* endures because its central commitments remain urgent. It asks that buildings be strong without waste, useful without compromise, and beautiful without pretense; that they respond to climate and place; and that those who design them accept responsibilities to patrons, users, and the city. In an era concerned with resilience, public health, and sustainable resources, Vitruvius's disciplined attention to materials, siting, and maintenance feels newly practical. Equally, his insistence that architects think broadly gives the book continuing appeal, linking ancient craft to contemporary design and making it a classic that structures debates we still conduct.

Synopsis

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Marcus Vitruvius Pollio's *The Ten Books on Architecture* is a Latin treatise composed in the late first century BCE and dedicated to Augustus. Vitruvius frames architecture as a learned discipline integrating practice and theory, outlining the education and ethical responsibilities of the architect. He introduces foundational principles of firmness, utility, and beauty, together with proportion, symmetry, and decorum. Book I also treats city planning: site selection, orientation, healthful air, and defense. Climate and the course of the sun guide street layout and building exposure. Throughout, Vitruvius positions architecture as a civic art whose standards derive from nature, reason, and measured precedent.

Book II surveys building materials, emphasizing empirical properties and proper preparation. Vitruvius compares types of stone, notes the burning and slaking of lime, and distinguishes sands suitable for mortar, including volcanic pozzolana, prized for hydraulic concrete. He discusses bricks and their drying, timber species and seasoning, and techniques to reduce decay or fire risk. Regional variations and quarrying practices matter for durability and cost. The account interweaves practical recipes with warnings about adulteration and unsuitable sources. By grounding construction in material science as observed on site, Vitruvius seeks to secure structural integrity and longevity before ornament or planning are considered.

Books III and IV detail sacred architecture and the classical orders. Vitruvius sets out canons of proportion for Ionic, Doric, and Corinthian columns and entablatures, using a modular system to maintain coherence across parts. He links proportion to the human body as a model for harmony. The treatise explains intercolumniation types and the effects they produce, and distinguishes temple plans, including peripteral, pseudodipteral, and others. He also addresses Tuscan and Etruscan forms and prescribes appropriate ornament and layout for deities and cult practice. The emphasis falls on fitness, clarity, and consistency, aligning structural logic with ritual and visual expectations.

Book V turns to civic buildings and the spaces that support communal life. Vitruvius analyzes forums and basilicas with attention to dimensions, circulation, and light. He expounds theater design, notably seating geometry, stage proportions, and acoustic theory, including the placement of resonant vessels to reinforce sound. Baths, palaestrae, and harbors receive practical guidance on orientation, ventilation, and foundations, with notes on using hydraulic concrete for breakwaters. The prescriptions balance spectacle and serviceability, insisting that public works be sited, scaled, and constructed to accommodate crowds,

promote health, and display dignified order appropriate to the city's status and environmental conditions.

Book VI addresses domestic architecture, contrasting Greek and Roman traditions and adapting layouts to climate, latitude, and social use. Vitruvius describes atrium houses and peristyle courts, arranging rooms by function and season, with attention to light, privacy, and cross-ventilation. He relates room proportions to human activity, recommending dimensions for dining rooms, oeci, and bedrooms, and differentiating reception spaces suited to patrons and clients. Rural villas require service areas for production and storage, while urban dwellings contend with street noise and shade. The guidance treats comfort and decorum as technical problems, to be solved through orientation, proportion, and considered circulation.

Book VII examines finishes and decorative techniques that protect and enrich interiors. Vitruvius prescribes multilayer plaster systems, lime putty maturation, and aggregates, leading to polished stucco and durable pavements such as opus signinum. He explains fresco painting on wet plaster and surveys mineral pigments, noting their sources, preparation, and stability. Remedies for damp, salt efflorescence, and smoke staining aim to preserve color and surface. He also records methods for veneering with thin stone, setting marbles, and achieving even illumination. Ornament remains subordinate to construction, but, properly executed, contributes to salubrity and dignified appearance by sealing, smoothing, and proportionally articulating surfaces.

Book VIII is devoted to water: its discovery, qualities, and conveyance. Vitruvius offers techniques to locate springs, evaluate taste and clarity, and recognize healthful sources. He compares conveyance methods—channels, clay pipes, and lead pipes—observing material effects on water quality and recommending gradients and settling basins for aqueducts. Wells and cisterns are designed with waterproofing and filtration in mind. Practical tests and site observation guide decisions, while hydraulic concrete enables durable works below the waterline. The discussion links public health to engineering, asserting that reliable supply, careful materials choice, and controlled flow are prerequisites for urban growth and daily life.

Book IX connects architecture to astronomy and geometry, arguing that builders must grasp celestial motions to orient structures and measure time. Vitruvius introduces the analemma and principles for constructing sundials suited to different latitudes, alongside notes on the zodiac, planets, and the winds. This cosmological primer supports practical tasks: aligning streets, placing windows for seasonal sun, and calibrating timekeeping devices. He compiles Greek sources and emphasizes proportional reasoning, reinforcing architecture's dependence on mathematics. The aim is not speculative astronomy but applied knowledge that secures accurate orientation, consistent shadows, and reliable schedules in the planning and operation of buildings.

Book X catalogues machines and engines used in construction, transport, and warfare. Vitruvius describes cranes, capstans, and compound pulleys; water-lifting devices such as the screw and wheel; force pumps and the water organ; and siege equipment including ballistae and tortoises, often crediting Greek innovators. He stresses stability, materials, and mechanical advantage, linking workshop practice to geometric principles. The treatise as a whole culminates in a vision of architecture as an integrated discipline uniting science, craft, and civic purpose. As the only comprehensive ancient architectural treatise to survive, it has long served as a reference point for proportion, planning, and technical method.

Historical Context

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The Ten Books on Architecture emerged in the late first century BCE, when Rome had consolidated control over the Mediterranean and was transitioning from a turbulent republic to Augustus's principate. Italy and the provinces were administered through the Senate, magistracies, and expanding imperial offices, while armies and priestly colleges buttressed authority. Urban life centered on the forum, baths, theaters, and temples. In this setting, architecture was both a craft and a tool of statecraft. Vitruvius wrote in Latin for Roman patrons yet drew deeply on Greek learning, crafting a comprehensive treatise that addressed the practical tasks of building within a society reorganizing its institutions and ideals.

The decades before the treatise were marked by civil wars: Sulla's dictatorship, the rise of Pompey and Caesar, Caesar's assassination in 44 BCE, and renewed conflict among rival factions. The decisive Battle of Actium in 31 BCE left Octavian (Augustus) dominant. Augustus presented his rule as the restoration of order and tradition, channeling resources into construction to stabilize civic life and display legitimacy. Vitruvius's work, typically dated to the 30s–20s BCE and dedicated to Augustus, answers this moment: it offers standards, definitions, and procedures that transform building from ad hoc practice into a disciplined public good aligned with the new political settlement.

Augustus's building program set the tone for the age. He famously boasted (as recorded later by Suetonius) that he found Rome a city of brick and left it of marble, and his *Res Gestae* claims the restoration of many temples, including eighty-two in a single year. This policy nurtured conservative piety while employing architecture as civic spectacle. Vitruvius's extended treatment of temples, proportions, and decorum serves that program by supplying criteria for appropriate design according to deity, site, and ritual. His stress on propriety and order turns the grammar of Greek architecture into a Roman moral and political language that could underwrite Augustan restorations.

Rome and its provinces were being reshaped through colonization and municipal development. New veteran colonies and refounded cities across Italy, Gaul, Spain, Africa, and the East required grids, forums, basilicas, markets, and walls. Land division (centuriation) and civic standardization accelerated. Vitruvius devotes attention to the siting of towns, orientation to winds, street layouts, and public amenities, offering a template portable to provincial contexts. In this respect the treatise mirrors the empire's administrative reach: it translates metropolitan ideals into implementable plans that local magistrates and builders

could adapt, supporting a common civic fabric from the Italian heartland to newly organized communities.

The treatise stands within a Hellenistic tradition of technical writing and architectural theory. Vitruvius cites Greek masters—architects and engineers such as Ictinus, Hermogenes, Dinocrates, Archimedes, and Ctesibius—and insists that an architect be versed in geometry, music, medicine, law, and philosophy. This broad education aligns with Roman elite values of the late Republic, when Greek *paideia* was a mark of status. Yet his prefaces also chastise contemporary builders who pursue ornament without understanding. The critique responds to a marketplace awash in luxury and novelty, redirecting ambition toward measured proportion, *symmetria*, and the triad of *firmitas*, *utilitas*, *venustas* as civic virtues.

Technological change undergirded the era's construction boom. Roman concrete (*opus caementicium*), matured in the second and first centuries BCE, allowed vaults, domes, and vast substructures. Vitruvius describes lime, aggregates, timber seasoning, and the volcanic sands from the Bay of Naples—*pozzolana*—that set under water, enabling harbors and foundations. He notes material properties and failure modes, giving builders empirical guidance. The expanding exploitation of stone, including Luna (Carrara) marble and widespread travertine from Tibur, reshaped urban aesthetics and logistics. By codifying materials science, the treatise both reflects and advances the late Republican shift from ashlar to concrete as the backbone of Roman monumental building.

Mechanical ingenuity was equally central. The book catalogues cranes, hoists, capstans, and pulley systems used to lift heavy elements, along with water-lifting devices such as the Archimedean screw, *tympanum*, and chain of buckets. It also preserves the earliest known description of a water-powered mill, indicating experimentation with rotary power for grain processing. Vitruvius details siege engines and *ballistae*, testimony to a society that had honed military mechanics and repurposed them for civil tasks. Writing in Latin consolidates this technical knowledge within Roman state culture, ensuring that the tools of conquest and infrastructure became standardized components of urban development.

Water management defined Roman urbanism. Aqueducts—Aqua Marcia, Tepula, and others—preceded Augustus, and the early principate saw renewed investment, notably Agrippa's work in the 30s–10s BCE, including the Aqua Iulia and Aqua Virgo. Vitruvius systematizes hydrological knowledge: sources, tests for potability, gradients, and the *chorobates* for leveling. He discusses distribution networks and public fountains and remarks on health, warning against lead piping and favoring clay as safer—a notable public-health sensibility. The treatise thus aligns with and informs the era's push to supply water to baths, fountains, and households, linking technical precision to civic well-being.

The late Republican city was crowded, noisy, and prone to fire. *Insulae* (multistory rental blocks) jostled with workshops, and property lines were contentious. Fires and collapses prompted regulatory concern that intensified under the principate. Vitruvius's chapters on materials, walls, and finishes recommend lime plasters, stuccoes, and careful bonding, and his attention to ventilation, light, and site orientation engages real urban hazards. While later imperial measures formalized height limits and firefighting corps, the treatise anticipates a culture of prevention, embedding resilience in construction practice. It reflects a world where building was not merely expressive but also a primary instrument of public safety.

Religious revival was integral to Augustan policy. Restored temples, priesthoods, and rituals asserted continuity with ancestral customs. Vitruvius's prescriptions for temple types, orders, column spacing, and orientation serve this revival by connecting architectural form with divine attributes and ritual approach. He links decorum to the character of deities, ensuring that sacred space communicates proper reverence. His guidance on altars, porticoes, and *pronaoi* harmonizes Greek formal canon with Roman cult practice. In this way the treatise functions as a manual for piety in stone, translating political claims of moral renewal into a concrete program for sanctuaries across the empire.

Public entertainment, essential to civic cohesion and elite competition, receives systematic treatment. Vitruvius discusses theater planning, *cavea* geometry, and acoustics, recommending sounding vessels (*echea*) and precise proportional relationships to carry the voice—a direct inheritance from Greek harmonic science. Seating arrangements traditionally mapped civic hierarchy, and access routes managed large crowds. By prescribing rational layouts, sightlines, and auditory clarity, the treatise underwrites an orderly spectacle culture consonant with Augustan ideals. It registers how politics, performance, and technology merged in spaces where consensus was displayed and negotiated through festivals, dramas, and official ceremonies.

Rome's military machine, although turned inward during the civil wars, remained the empire's backbone. Siegecraft, artillery, and fortification science had been refined over centuries of expansion. Vitruvius includes practical instructions for *ballistae* and other engines, reflecting a technical repertoire essential both in war and in the construction of walls, bridges, and temporary works. His attention to logistics and machine elements mirrors a society where engineering supported both conquest and civil pacification. In the Augustan settlement, the codification of such knowledge helps preserve expertise during a shift from internecine conflict to frontier defense and infrastructural consolidation.

The treatise integrates architecture with broader ancient science. Vitruvius discusses gnomonics, sundials, and celestial orientation, situating buildings within cosmic order. The recent Julian calendar reform (46–45 BCE) had standardized civic time, and the alignment of civic space with regulated time and celestial phenomena carried ideological weight. He also echoes Hippocratic medicine in his concern for airs, waters, and places, advising healthy sites and

acknowledging climate's effects on bodies and customs. Such passages locate architecture within natural philosophy, reaffirming that good building, like good governance, conforms to rational principles discoverable in nature and useful for public health.

The economic and labor systems of the late Republic and early principate depended on slaves, freedmen, and skilled artisans, often organized in collegia. Building drew on complex supply chains—quarries, timber stands, lime kilns, brickworks, and transport networks. Vitruvius addresses cost, procurement, and resource management in his discussion of *distributio* (economy), advising masters of works and patrons on appropriate expenditures and allocations. In a culture where euergetism and public contracts financed construction, his insistence on measured spending and quality control critiques corruption and waste, aligning a moral economy of materials with the accountability that Augustan administration sought to project.

A flourishing literary culture reinforced technical codification. The first public library in Rome was founded by Asinius Pollio in the 30s BCE, and Augustus later established libraries on the Palatine and in the Porticus Octaviae. Latin prose increasingly accommodated specialized subjects—agriculture (Varro), geography (Agrippa's map, later compilations), and, here, architecture. Vitruvius, translating Greek theory into Latin while preserving Greek terminology, positions architecture among the liberal arts and makes it legible to Roman magistrates and patrons. His prefaces advocate for learned practice and defend the social dignity of architects, reflecting a milieu where knowledge became a civic resource.

Land survey and infrastructure policy played central roles in consolidating Roman power. Centuriation rationalized rural territory, and roads, bridges, and aqueducts demanded precise leveling and measurement. Vitruvius details instruments like the groma's functional relatives, the dioptra, and especially the chorobates, explaining how to achieve reliable gradients. By formalizing surveying, the treatise supports cadastral control, taxation, and the reliable delivery of water—state concerns intensified by Augustus's administrative reorganization. The emphasis on precision and repeatability imagines a built environment that mirrors imperial order, extending the reach of Roman governance into the technical routines of construction and maintenance.

Vitruvius's city-siting advice also registers contemporary expansion and public health anxieties. He warns against marshy grounds and insalubrious winds, recommends orientations for sun and breezes, and ties urban form to climate. These prescriptions respond to real settlement patterns, from Italian valleys to coastal plains, where new colonies and veteran towns were founded. The marriage of practical meteorology with urban planning echoes the era's ambition to harmonize human settlement with a stable cosmos, a theme that resonated with Augustan propaganda of restored nature and peace. Architecture thus becomes a means of aligning civic life with the rhythms of the environment and seasons—order in space and time.

Author Biography

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Marcus Vitruvius Pollio was a Roman architect, engineer, and author active in the late first century BCE. He is known for *De architectura*, a comprehensive treatise in ten books that became the most influential surviving text on ancient architecture and building technology. Composed during the transition from the Roman Republic to the Augustan principate and dedicated to Augustus, the work sets out principles that shaped architectural theory for centuries. Vitruvius wrote as a practitioner addressing both technical craft and civic purpose, seeking to codify knowledge ranging from materials and machines to urbanism, and to articulate the intellectual stature of architecture.

Little is securely known about Vitruvius's early life and formal training, but his treatise reveals a technical education grounded in Roman engineering and a sustained engagement with Greek scholarship. He insists that architecture belongs among the liberal arts and requires familiarity with geometry, music, medicine, and astronomy. Throughout *De architectura* he cites Greek designers and theorists, including Ictinus, Hermogenes, and Dinocrates, and relies on writers such as Aristoxenus for acoustics. His knowledge of Hellenistic proportion theory, temple design, and theater science reflects a milieu in which Roman builders assimilated Greek methods while adapting them to the civic and infrastructural needs of Rome.

Vitruvius refers to his experience as a military engineer, describing siege machines, ballistae, and field works with practical specificity. Although precise posts and campaigns remain uncertain, his descriptions indicate service in the Roman army and work on public projects. *De architectura* was composed and revised in the late first century BCE and addressed to the new imperial patronage. The ten books proceed systematically: education of the architect; materials; temple orders; public buildings such as theaters and baths; private houses; pavements and decorative finishes; hydraulics and water supply; gnomonics and timekeeping; and machines. No extant building can be securely attributed to him.

Vitruvius framed architecture as a discipline governed by three interdependent aims: *firmitas*, *utilitas*, *venustas*—stability, utility, and beauty. He advocated rigorous education, ethical conduct, and responsibility to public health and safety, advising attention to climate, site, and water quality. His account of proportion links buildings to the measured harmony of the human body, a conceit that later inspired depictions of the "Vitruvian Man." He treated the architectural orders as systems of measured relationships, not mere ornament. In theater design he combined acoustical theory with practical seating and

sightline concerns, illustrating his broader commitment to marry speculative knowledge with empirically tested craft.

In addition to temples and houses, Vitruvius documented a wide range of technologies. He described lime, pozzolana, timber, and masonry; vaulting and roof construction; and durable pavements. His books on water address sources, aqueduct design, distribution, and testing for potability. He explained sundials, calendars, and astronomical orientations used to lay out cities and align buildings. His final book catalogs machines, including cranes, hoists, water-lifting devices, and war engines, setting out principles of mechanics and safety. This encyclopedic approach presents architecture as an applied science grounded in geometry and natural philosophy, yet always directed toward civic usefulness and environmental fitness.

De architectura circulated in antiquity and survived the Middle Ages in manuscript tradition, though its readership was limited. With the advent of printing, the text was edited and translated in the fifteenth and sixteenth centuries, becoming a foundational authority for Renaissance humanists and architects. Figures such as Leon Battista Alberti, Sebastiano Serlio, Andrea Palladio, and Leonardo da Vinci engaged closely with Vitruvian concepts of proportion, orders, and urban form. Commentators debated his prescriptions while adapting them to contemporary practice. The treatise shaped pedagogies, notational conventions, and the very idea that architecture rests on codified principles accessible to reasoned inquiry.

Details of Vitruvius's later life, including his death, remain uncertain. The dedication of his treatise to Augustus suggests he sought or received imperial favor, but firm evidence is sparse. His legacy rests on the survival and interpretive afterlife of *De architectura* rather than on identifiable buildings. Modern historians rely on his chapters to reconstruct Roman construction, hydraulics, and town planning, while architects and theorists continue to engage his triad of aims and his humanist definition of the field. The term "Vitruvian" now signals a durable ideal: architecture as a measured synthesis of technical knowledge, public purpose, and aesthetic judgment.

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PREFACE

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During the last years of his life, Professor Morgan had devoted much time and energy to the preparation of a translation of Vitruvius, which he proposed to supplement with a revised text, illustrations, and notes. He had completed the translation, with the exception of the last four chapters of the tenth book, and had discussed, with Professor Warren, the illustrations intended for the first six books of the work; the notes had not been arranged or completed, though many of them were outlined in the manuscript, or the intention to insert them indicated. The several books of the translation, so far as it was completed, had been read to a little group of friends, consisting of Professors Sheldon and Kittredge, and myself, and had received our criticism, which had, at times, been utilized in the revision of the work.

After the death of Professor Morgan, in spite of my obvious incompetency from a technical point of view, I undertook, at the request of his family, to complete the translation, and to see the book through the press. I must, therefore, assume entire responsibility for the translation of the tenth book, beginning with chapter thirteen, and further responsibility for necessary changes made by me in the earlier part of the translation, changes which, in no case, affect any theory held by Professor Morgan, but which involve mainly the adoption of simpler forms of statement, or the correction of obvious oversights.

The text followed is that of Valentine Rose in his second edition (Leipzig, 1899), and the variations from this text are, with a few exceptions which are indicated in the footnotes, in the nature of a return to the consensus of the manuscript readings.

The illustrations in the first six books are believed to be substantially in accord with the wishes of Professor Morgan. The suggestions for illustrations in the later books were incomplete, and did not indicate, in all cases, with sufficient definiteness to allow them to be executed, the changes from conventional plans and designs intended by the translator. It has, therefore, been decided to include in this part of the work only those illustrations which are known to have had the full approval of Professor Morgan. The one exception to this principle is the reproduction of a rough model of the Ram of Hegetor, constructed by me on the basis of the measurements given by Vitruvius and Athenaeus.

It does not seem to me necessary or even advisable to enter into a long discussion as to the date of Vitruvius, which has been assigned to various

periods from the time of Augustus to the early centuries of our era. Professor Morgan, in several articles in the *Harvard Studies in Classical Philology*, and in the *Proceedings of the American Academy*, all of which have been reprinted in a volume of *Addresses and Essays* (New York, 1909), upheld the now generally accepted view that Vitruvius wrote in the time of Augustus, and furnished conclusive evidence that nothing in his language is inconsistent with this view. In revising the translation, I met with one bit of evidence for a date before the end of the reign of Nero which I have never seen adduced. In viii, 3, 21, the kingdom of Cottius is mentioned, the name depending, it is true, on an emendation, but one which has been universally accepted since it was first proposed in 1513. The kingdom of Cottius was made into a Roman province by Nero (cf. Suetonius, *Nero*, 18), and it is inconceivable that any Roman writer subsequently referred to it as a kingdom.

It does seem necessary to add a few words about the literary merits of Vitruvius in this treatise, and about Professor Morgan's views as to the general principles to be followed in the translation.

Vitruvius was not a great literary personage, ambitious as he was to appear in that character. As Professor Morgan has aptly said, "he has all the marks of one unused to composition, to whom writing is a painful task." In his hand the measuring-rod was a far mightier implement than the pen. His turgid and pompous rhetoric displays itself in the introductions to the different books, where his exaggerated effort to introduce some semblance of style into his commonplace lectures on the noble principles which should govern the conduct of the architect, or into the prosaic lists of architects and writers on architecture, is everywhere apparent. Even in the more technical portions of his work, a like conscious effort may be detected, and, at the same time, a lack of confidence in his ability to express himself in unmistakable language. He avoids periodic sentences, uses only the simpler subjunctive constructions, repeats the antecedent in relative clauses, and, not infrequently, adopts a formal language closely akin to that of specifications and contracts, the style with which he was, naturally, most familiar. He ends each book with a brief summary, almost a formula, somewhat like a sigh of relief, in which the reader unconsciously shares. At times his meaning is ambiguous, not because of grammatical faults, which are comparatively few and unimportant, but because, when he does attempt a periodic sentence, he becomes involved, and finds it difficult to extricate himself.

Some of these peculiarities and crudities of expression Professor Morgan purposely imitated, because of his conviction that a translation should not merely reproduce the substance of a book, but should also give as clear a picture as possible of the original, of its author, and of the working of his mind. The translation is intended, then, to be faithful and exact, but it

9 Opus reticulatum is a Roman masonry facing made of small pyramid-shaped tufa or brick blocks set in a diagonal, net-like pattern; Vitruvius notes it was fashionable but prone to cracking because its beds and builds spread stresses in multiple directions. He contrasts it with opus incertum, an earlier rubble-in-course technique that is less decorative but often stronger.

10 Travertine is a form of limestone deposited by mineral springs (notably near Tivoli) that is relatively hard and durable in weather and load-bearing situations. Vitruvius warns it resists moisture and weight well but can spall or split under intense heat because of air-filled pores that expand when heated.

11 The Greek term ἐμπλεκτον (emplekton) refers to a method of wall construction where facings are carefully finished and the interior is built as an integral, interlocked mass rather than being crudely filled with loose rubble. Vitruvius praises this technique for producing solid, monolithic walls that bond facings to the interior and avoid the weaknesses of mere surface-facing.

12 Διάτονοι in Vitruvius' text denotes long bond-stones or through-stones that extend through the full thickness of a wall and show at each face. These stones tie the outer facings to the core and significantly improve the overall solidity and resistance to separation or bulging.

13 Artemisia II was the sister and widow of Mausolus who ruled Caria in the mid-4th century BCE and is historically credited with completing the Mausoleum at Halicarnassus. Vitruvius recounts her naval stratagems defending Halicarnassus and later actions against Rhodes, reflecting historical accounts of her political and military activity.

14 Favonius is the Roman name for the west wind (equivalent to the Greek Zephyrus), traditionally associated with mild spring breezes. Vitruvius uses its onset as a seasonal marker, advising that timber be felled before Favonius begins to blow because sap rises in spring and weakens wood for construction.

15 A Greek word Vitruvius uses for the projection of a base; transliterated as hecphora or ekphora in later works. It denotes how far the base of a column projects outward from the shaft and is here given as a measured proportion of the column thickness.

16 A Greek term Vitruvius equates with the Roman scotia or a concave moulding at the base of a column. In classical architecture this recessed channel helps form shadow lines and is an important element in base profiles and ornamentation.

17 A Latinized form of the Greek/Latin geometric term cathetus, meaning a perpendicular or vertical line. Vitruvius uses it for vertical guide-lines drawn down from the abacus to lay out spirals and volutes when designing capitals.

18 An ancient Greek sculptor and designer famed for refined decorative work; Vitruvius credits him with adopting the acanthus-motif into the Corinthian

capital. The precise dates and biographical details are uncertain, but he is generally associated with classical Greek sculpture (traditionally placed around the 5th–4th centuries BCE).

19 A Mediterranean plant (genus *Acanthus*) whose stylized leaves became a standard decorative motif for Corinthian capitals. Vitruvius recounts the traditional origin story in which acanthus leaves growing around a tomb inspired the capital's leaf forms.

20 Followers of Pythagoras, an ancient philosophical and mathematical school noted for numerical and geometrical doctrines. Vitruvius refers to their symbolic use of numbers (for example, the cube of 216 lines) to explain why some ancient authors organized long treatises according to numerical principles.

21 In Roman theatres the *scaena* is the stage building or decorated backdrop (the *scaenae frons*) behind the acting area; it contained doors, scenery, and often multiple storeys of columns and decoration, serving both practical and visual functions in performances.

22 *Echea* (Greek ἤχεια) are resonant vessels or 'sounding jars' that Vitruvius recommends placing in niches beneath seating to reinforce and harmonize the actors' voices; builders sometimes used bronze vessels or large clay jars to produce these acoustic effects.

23 Aristoxenus was an ancient Greek music theorist (active roughly in the late 4th century BCE) whose writings on harmonics and melody influenced later musical and architectural acoustics; Vitruvius cites him as a source for the classification of modes and tetrachords.

24 This phrase refers to the volcanic ash (commonly called *pozzolana*, from the Pozzuoli/Cumae area) used by the Romans as an ingredient in hydraulic concrete; mixed with lime, it produces a mortar that hardens under water and was crucial for marine and harbour construction.

25 A *Laconicum* is a Roman sweating-room or dry-heat bath (similar to a sauna), typically circular with a domed roof and an adjustable central opening or disc to regulate temperature; Vitruvius places it adjacent to *tepidaria* and other bathing rooms in bath complexes.

26 The *sambuca* is an ancient stringed instrument mentioned by Greek and Roman writers; its exact form is uncertain (reconstructions vary between small harps and triangular lyres), but Vitruvius uses the image to compare celestial geometry to musical harmony.

27 A Latin term used here for the central open court of a Roman house (what is often called an *atrium*). It functioned as the main interior space for light, air, rain collection, and household activity, and the chapter explains its proportions and variations.

28 A roof-opening or central aperture in traditional Roman atriums through which rainwater fell, as described in the Tuscan atrium paragraph. In Roman houses the compluvium typically worked with a floor basin (impluvium) to collect runoff and light the interior.

29 An architectural type named for having four supporting columns (from Greek tetra, 'four'), described here as an atrium whose girders are supported at the angles by columns. The arrangement reduces span stresses on beams and is a common classical design term for buildings or porticoes with four columns.

30 A principal room in a Roman house, usually located on the axis between the atrium and the peristyle, used as a reception room, office, and place for family records or display. Vitruvius prescribes specific proportions for the tablinum because it served both practical and social functions in the household.

31 A colonnaded courtyard or garden court surrounded by a continuous row of columns, borrowed from Greek house plans and described here with proportions and column spacing. Peristyles provided a shaded, open-air center for private life, circulation, and views of planted areas.

32 Wedge-shaped masonry blocks used to construct arches, whose joints radiate toward the arch centre; Vitruvius notes their importance for discharging loads and preventing beams from sagging. Properly arranged voussoirs keep an arch together and allow timber elements to be replaced without collapsing the support.

33 In Roman architecture, stucco refers to plaster made from lime, sand or crushed marble used as a surface coating and for molded decoration. Polished stucco finishes were often burnished or tinted to imitate marble and were a common, less costly alternative to actual stone veneers.

34 Pontic wax denotes a type of beeswax or regional wax associated with Pontus (the Black Sea coast of Anatolia) used as a protective, water-resistant coating. Vitruvius describes melting and applying it over pigments to seal and preserve colors from light and moisture.

35 Cinnabar is the mineral mercury sulfide (HgS) historically mined as the primary source of the red pigment vermilion. The ore yields elemental mercury (quicksilver) when roasted or processed, and both cinnabar and mercury are now known to be toxic.

36 Quicksilver is the older name for mercury, a dense, silvery liquid metal used in antiquity for gilding, metalworking (amalgams), and pigment production. Its high density explains why many heavy objects float on it, while metals like gold sink because they form amalgams with mercury rather than simply floating.

37 Ostrum (Latin/Greek) refers to the purple dye obtained from marine shellfish (notably Murex species), commonly called Tyrian purple, which was highly prized

and expensive in antiquity. Variations in shade depended on species and processing, and the dye was associated with high status and official garments.

38 Cleitor (also spelled Kleitor) was an ancient town in Arcadia, a mountainous region of the central Peloponnese in Greece. In pastoral poetry and local legends it is commonly used as a rural setting for shepherds and springs, which matches the poem's reference to a shepherd visiting a refreshing fountain.

39 Melampus is a legendary figure in Greek mythology, known as a seer and healer who cured the daughters of King Proetus of madness. The passage alludes to that mythic cure to explain why certain springs were reputed to have the power to affect mental health.

40 Zea was the name used in antiquity for various Greek localities (including a harbor near Athens and other islands); the text refers to a Zea associated with a spring reputed to make drinkers lose their understanding. Ancient authors often attached short engraved epigrams to such local curiosities to warn or amuse visitors.

41 Susa was an ancient city in the Near East that served as a capital of the Persian (Achaemenid) empire and lies in the region of modern Shush in southwestern Iran. The book's anecdote about a spring at Susa (said to cause loss of teeth when drunk) reflects the Roman-era habit of recording local hydrological oddities encountered across the empire.

42 Masinissa (often spelled Massinissa) was a king of Numidia in North Africa who lived in the 3rd–2nd centuries BCE and allied with Rome during the Punic Wars. The text's reference to "Masinissa's son" places the anecdote in a North African landholding context and signals Roman connections with native royal families.

43 The chorobates is a Roman levelling instrument described here as a straightedge about twenty feet long with legs, crosspieces, plumb-lines, and a water groove for precise leveling. Vitruvius recommends it for laying out very slight gradients such as those needed in aqueduct construction because it reduces the errors of other devices.

44 'Signinum work' (signinum) is a Roman form of waterproof mortar used to line cisterns and tanks, made from sand, lime, and crushed pottery or volcanic rock. The passage's recipe—mixing sand, lava fragments, and lime—reflects standard ancient practice for creating a dense, water-resistant masonry lining.

45 Ephesus was an important ancient Greek city on the coast of what is now western Turkey, famed for the Temple of Artemis (Diana). It was a major cultural and commercial center in antiquity and is often cited in classical texts as the site of significant building projects and local laws.

46 Praetors and aediles were Roman magistrates: praetors held judicial and sometimes military authority, while aediles were officials responsible for public