A HISTORY OF

ARCHITECTURAL THEORY

FROM VITRUVIUS TO THE PRESENT

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r. Vitruvius and architectural theory in Antiquity

Vitruvius’s *De architectura libri decem* is the only major work on the architecture of Classical Antiquity to have survived. Great significance thus attaches to it, and this has been enhanced in the light of history in that the whole literature on architectural theory from the Renaissance onwards has been based on Vitruvius or on a dialogue with his ideas. Without a knowledge of Vitruvius it is impossible to grasp any of the discourse on architectural theory from the Renaissance onwards – at least up until the nineteenth century.

Vitruvius was not the first to write on architecture, but all earlier writings on the subject have been lost. These Greek and Roman treatises, some of whose titles are known, were descriptions of individual buildings or dealt with specific problems, such as the proportions of temples. It is the task of archaeological research to lay bare Vitruvius’s relationship to the sources he used but only mentioned in passing (Book VII, preface), and to the actual buildings of Antiquity. For the subsequent history of architectural theory, Vitruvius’s *Ten Books on Architecture* can and must be taken as a whole, although this work’s patchwork character and erratic terminology – partly due to confused translations from Greek into Latin – cannot be ignored. Indeed, obscure passages in Vitruvius are largely responsible for similar obscurities and debate in subsequent architectural theory.

Vitruvius was the first – as he himself proudly maintained (Book IV, preface) – to cover the entire field of architecture in systematic form. Later works, such as the compendium by M. Cetius Faventinus (?third century), the *De diversis fabricis architectonicae*, or the Late Imperial work of Palladius (Rutilius Taurus Aemilianus), *De re rustica*, are direct or indirect complications from Vitruvius’, and have little significance for architectural theory.

Few biographical details are known about Vitruvius. It would have been useful to know something about his travels and his knowledge of the buildings he mentions. Since only his family name is known, but not his praenomen nor his cognomen, unproven identifications have been proposed, the main one being with a Roman noble from Formia named Mamurra. Attempts to reconstruct his biography must be judged with equal caution. Vitruvius served in the Roman army under Julius Caesar, building siege machines and perhaps bridges, and after Caesar’s death (44 BC) he was involved in the construction of the Roman water supply under Octavian. He retired about 33 BC, and through the good offices of the by then Emperor Augustus’s sister Octavia, received a pension which ensured him a care-free old age. Thielsocher places his birth in 84 BC, and if this date is accepted, he would have begun working on his treatise on architectural theory at the age of fifty-one, just as he was entering retirement. The period during which the *Ten Books on Architecture* were written must have fallen between 33 and 14 BC, on external evidence. The prefaces to the books, setting out basic principles,
were probably composed later, and the order in which he wrote the books themselves is not entirely clear.

It emerges from several of Vitruvius's own statements that he was not a successful architect. He mentions only one building of his own, the basilica in the provincial town of Fano. He enjoyed no recognition as a creative architect. His treatise was intended to increase awareness of the importance of architecture, and to constitute a lasting memorial to himself (prefaces of Books II and VI).

The treatise De architectura libri decem is divided into ten books, each of which has a preface that is loosely related, if at all, to the book in question, as well as giving a summary of the previous book. The prefaces should be seen as forming a whole, and contain fundamental statements about the aim of the treatise and the author's image of himself.

The contents of the ten books are as follows:

- **Book I**: The education of the architect; basic aesthetic and technical principles; subdivisions of architecture — buildings, horology, mechanics; public edifices and domestic architecture; town-planning.
- **Book II**: The evolution of architecture; building materials.
- **Book III**: Temple construction.
- **Book IV**: Types of temple; the Orders; the theory of proportion.
- **Book V**: Communal buildings, with special reference to theatres.
- **Book VI**: The private house.
- **Book VII**: The use of building materials; wall painting and colours.
- **Book VIII**: Water and the provision of water supply.
- **Book IX**: The solar system; sundials and water-clocks.
- **Book X**: The construction of machinery and mechanics.

In the prefaces various issues are discussed, bearing on three types of subject:

- a) Vitruvius as a person;
- b) the function of the treatise;
- c) problems of architecture in general; and here Vitruvius succeeds in bringing his conception of architecture into line with the contemporary ideology of the state.

The treatise is dedicated to the Emperor Augustus (Book I, preface). The composition of the book and its dedication are described by Vitruvius himself as tokens of gratitude for the pension awarded to him. The author, who describes himself in the preface to Book II as small, old and ugly, seeks to commend himself to Augustus through this work, possibly in the hope of receiving building commissions. In order to put his honesty and discretion in a good light, he tells the story of the architect Deinocrates, who appeared dramatically before Alexander the Great disguised as Hercules, in an attempt to secure the commission to execute a design he had brought with him. Alexander is said to have rejected the design, but to have entrusted to Deinocrates the building of Alexandria in Egypt. Vitruvius deprecates such methods of obtaining commissions and the favour of rulers, but would have you gain your approval with the help of my knowledge by the publication of this text-book. With his Ten Books, he would like to ensure the acclaim of posterity (Book VI, preface).

Vitruvius sees the aim of his treatise on several levels. Following the dedication and expression of thanks for the provision for his old age in the preface of Book I, a definition of the treatise is addressed to Augustus:
I have observed that you have already built much, are continuing to do so, and I will appreciate that you will also direct your efforts in the time that remains to you to the construction of public and private buildings, to be handed down to posterity as a fitting record of the greatness of your deeds. I have drawn up clearly defined rules, so that by studying them closely you will be able to judge for yourself the quality of the buildings you have already created and of those to come, for in these books I have laid down all the principles of architecture.  

Vitruvius was thinking, however, of a wider circle of users and was directly addressing the people for whom houses were built (architects, surprisingly, he was addressing only indirectly through the programme of training he had devised for them), for whom private building was to be made possible without an architect. Finally he states: 'Hence I thought I should compose with the utmost care a comprehensive work on the art of building and its methods in the belief that the future will not be ungrateful for this service to the world.'

Vitruvius discusses methodological and linguistic aspects of the presentation of his material in various passages. In the first chapter of Book I he apologises for his clumsiness of language, adding however: 'But I promise and hope in these books to present the meaning of my art and the principles involved in it clearly and with the greatest authority, not only for builders but for all educated people.'

In the preface to Book V he stresses the desirability of brevity and conciseness, but recognises the difficulty that his terminology is remote from ordinary speech and might be difficult to understand. For this reason he points to the importance of clear and succinct conceptual definitions, an aim he himself fails to fulfil in key passages.

In the preface to Book VII Vitruvius argues for originality and against artistic and literary plagiarism. In order to present his own work to the best advantage, he lists the sources he used, citing them only very selectively, however, so that his own originality is open to question.

In the preface to Book VIII Vitruvius surveys the significance of the four elements and the pre-eminence of water, to which subject the book is devoted. In the preface to Book IX he emphasises the importance of mathematics and geometry, and outlines a model of the cosmos, which turns into practical instructions for clock-making.

In the preface to Book X Vitruvius discusses the relationship between estimates and actual building costs and suggests making architects who exceed an estimate by more than twenty-five per cent liable to make good the surplus out of their own pocket.

As to architectural theory, Vitruvius asserts that the organisation of his work and the arrangement of its contents are systematic. This is in fact true only of practical matters. The theoretical backing appears only sporadically, after its exposition at the beginning of Book I.

In the first chapter of Book II Vitruvius gives his theory of the origins of architecture, the primary motivation for which he sees as the protection of man from the elements. The first houses, he writes, were imitations of natural formations (leaf huts, swallow's nests, caves), since 'men are by nature given to imitation and ready to learn.' He asserts that architecture was the first of the arts or sciences to emerge, and hence has a prima facie claim to primacy among the arts.

The invention of the 'rules of architecture' is mentioned almost as a passant. After evolving various types of house, men were led on by dint of observations made in their
studies from vague and uncertain judgements to fixed rules of symmetry." Vitruvius does not pursue the idea, but the 'rules' appear here as relative sizes arrived at empirically and so the seed is planted for the controversy about 'arbitrary beauty' that took place in the French Academy at the end of the seventeenth century.

In contrast to the relativist views of the rules of architecture indicated here, Vitruvius endows them with claims to absolute validity; in the first chapter of Book IX in an account of the cosmos and the planets, he describes the universe as an architectural design, in which the laws of the cosmos and of architecture are clearly regarded as identical. This view-point was to become fundamental to the claims later made for architecture, God being seen as architect of the world ('deus architectus mundi') and the architect as a second god ('architectus secundus deus'). Vitruvius himself, however, drew no conclusions from this concept, nor did he integrate it into a system.

In the first chapter of Book I Vitruvius builds up a detailed profile of the professional architect. The architect must be a master of fabrica (craft) and ratiocinatio (theory). Ratiocinatio is a concept characterised by scientific content; it demands a broadly ranging education for the architect, on the grounds that architecture makes varied demands on its practitioner. The architect must be skilled in writing, in order 'to be able to render his memory more reliable by the use of notes'; he must be a good draughtsman and have a command of geometry, in order to make correct perspective drawings and plans. A knowledge of the laws of optics is necessary for the correct use of light. Arithmetic is necessary for the calculation of costs and also of proportions. Historical knowledge is required if the architect is to understand ornament and its meaning. Philosophy should set its stamp on his character. An understanding of music is desirable for its application to tensions in siege machines and for the building of theatres. Medical knowledge is called for in order to take account of the requirements of climate and of health in building. Vitruvius further stipulates a basic knowledge of building law and of astronomy.

For Vitruvius a lengthy schooling in sciences and humanities is thus an essential part of an architect's training, which alone can lead to the sumnum templum architecturae.

In the second chapter of Book I Vitruvius sets out and defines the fundamental aesthetic principles of architecture. Here, from the theoretical point of view, lies the heart of the treatise. The fundamental concepts contained in this chapter underlay all discussion of architectural theory right up to the nineteenth century. They must therefore be considered in detail. The subject at issue is the whole scope of ratiocinatio, the intellectual apprehension of architecture.

Architecture, as Vitruvius states in the third chapter, must satisfy three distinct requirements: formitas, utilitas and venustas. Formitas (strength) covers the field of statics, construction and materials. Utilitas (utility) refers to the use of buildings and the guarantee of successful functioning. Venustas (beauty) includes all aesthetic requirements, that of proportion above all. With reference to public buildings, Vitruvius relates these considerations to each other as follows:

These [public facilities] must be built in such a way as to take account of strength, utility and beauty. The demands of strength will be met when the foundations are sunk to bedrock, and the building materials, whatever they are, are carefully chosen without trying to save money; those of utility when the layout of the sites
is faultless and does not make their use difficult, and when their arrangement is
convenient and in each case suited to its particular situation; and those of beauty
when the work has an elegant and pleasing appearance and the relative \textit{proportions}
of the individual parts have been calculated with true \textit{symmetry}.^1\)

The basic category of \textit{venustas} is divided into six basic concepts, of which only
one (\textit{distributio}) also comes under \textit{utilitas}; Vitruvius sometimes gives these ideas Latin
names, and sometimes, where there is patently no Latin equivalent, Greek:

\begin{itemize}
\item \textit{ordinatio} (\textit{tēkHN, taxis}).
\item \textit{dispositio} (\textit{idēōtia}, diathesis).
\item \textit{eurythmia}.
\item \textit{symmetria}.
\item \textit{decor}.
\item \textit{distributio} (\textit{olkovouia}, oeconomia).
\end{itemize}

Vitruvius's definitions, which cause difficulties in understanding these concepts,
given below, with interpretations.\textsuperscript{23}

\textit{Ordinatio} is the detailed proportioning of each separate part of a building, and
the working out of the general proportions with regard to \textit{symmetria}. The latter
is achieved by means of \textit{quantitas}, which the Greeks call \textit{posotés}. \textit{Quantitas} is the
taking of units of measure [\textit{moduli}] from the building itself, and the creation of
a harmonious whole from the individual parts.\textsuperscript{23}

\textit{Ordinatio} is the result of consistent proportioning of a building as a whole and
in detail. This proportioning is based on \textit{quantitas}, the module taken from the structure
itself (which presupposes that the structure has been planned by means of a basic
\textit{module-unit}). The theory of proportion is not expounded by Vitruvius at this point.

\textit{Dispositio} is the fitting arrangement of parts, and the elegant effect of the building
achieved through \textit{qualitas}. The various types of \textit{dispositio}, which the Greeks
call \textit{formis} (\textit{idēai, ideae}) are: \textit{ichnographia}, \textit{orthographia}, and \textit{scaenographia}.
\textit{Ichnographia} is the competent use of rules and compasses, by which ground plans
are laid out on site. \textit{Orthographia} is the representation of the front elevation of
the building and its appearance drawn according to rules, in proportion to the
proposed structure. \textit{Scenographia} is the delineation of the façade and the receding
sides of the building, the lines all meeting at the point of the compass [the
vanishing point]. These three all spring from \textit{cogitatio} (reflection) and \textit{inventio}
(invention). \textit{Cogitatio} is the laborious and painstaking effort expended to make
the imagined effect pleasing. \textit{Inventio} is the solving of difficult problems and the
discovery of new things by the application of a lively intelligence. These are the
goals of \textit{dispositio}.\textsuperscript{24}

\textit{Dispositio} denotes the design of a building (in plan, elevation and perspective) and
in execution, for which \textit{ordinatio} is clearly a necessary premise, while the execution
must be carried out with \textit{qualitas}, a concept which is given no further definition.
\textit{Reflection} (\textit{cogitatio}) and invention (\textit{inventio}) are required for the drawing up of a
design.

\textit{Eurythmia} implies an appearance that is graceful and agreeable in the way in
which its individual elements are arranged. It is achieved when these are of a
height proportionally suited to their breadth and of a breadth suited to their
length; when, in short, they all correspond \textit{symmetrically}.\textsuperscript{25}
Eurythmia is the result of proportion applied to a building and of the effect of such proportion on the beholder. It corresponds more or less to the modern conception of harmony.

4. Symmetria is the harmony arising out of the assembled parts of a building, and the correspondence of the separate parts to the form of the building as a whole in a fixed proportion. As in the human body eurythmia takes its symmetrical quality from the forearm [cubit], foot, palm, finger [inch] and the other parts, so it is with buildings. Particularly in the case of sacred buildings, symmetry is calculated either from the thickness of the columns, or from a triglyph, or from the module [Greek: embater].

By 'symmetry' Vitruvius means the harmony of the parts in relation to the whole within the total design, as measured by a module, his term corresponding to the present-day concept of proportion.

The concepts of ordinatio, eurythmia and symmetria are different aspects of the same aesthetic phenomenon; ordinatio might be described as the principle, symmetria as the result, and eurythmia as the effect.

Such compartmentalisation is only to a limited extent meaningful, and leads to conceptual confusion, which Vitruvius himself did not escape, and has led to endless arguments and misunderstandings in commentaries on him.

5. Decor is the correct appearance of a building, composed according to precedent [auctoritas] from approved elements. It is achieved by following convention, which the Greeks call thematismos, or by following common usage, or Nature. Convention is obeyed when buildings that are erected to Jupiter Fulgor, to the Heavens, to the Sun, or to the Moon, are hypaethral (open to the sky), for the appearance and effects of these gods we witness in the light of the open sky. Doric temples are to be built to Minerva, Mars and Hercules, for it is fitting that temples without ornament should be put up to these gods, in keeping with their virile nature. Temples in Corinthian style will have qualities more suited to Venus, Flora, Proserpina and the Nymphs of Springs, since buildings of more slender proportions, embellished with flowers, leaves and scrolls (volutes), seem to express their delicate nature more appropriately. The construction of temples in the Ionic style to Juno, Diana and Bacchus and other similar gods will be appropriate to their intermediate position, in that their character will avoid the severity of the Doric style on the one hand and the delicacy of the Corinthian on the other.

Decor concerns the appropriateness of form and content, not of applied embellishment. The use of the Orders comes under this heading. The attribution of specific qualities to specific orders points beyond aesthetics to the signification of architecture, that is, to architectural iconology.

6. Distributio is the advantageous management of materials and site, along with care and economy in the calculation of building costs... A second stage in distributio is reached when important buildings are erected for heads of households or for those with great wealth, or for dignified officials such as orators. Town houses obviously call for a different kind of construction from those which receive the products of country estates; different kinds of houses are required by money-lenders and others again by men of taste. For the powerful, however, whose thoughts govern the state, buildings must correspond to their special needs. In a
word, the distributio of buildings must be designed to suit their occupants.48
Only the second half of this definition comes into the category of senestas,
whereas the first belongs rather to that of utilitas. The relationship between buildings
and occupants anticipates a concept that was elevated into a system in the Enlightenment,
that of architecture parlante, according to which architecture should be the expression
of its function or of the status of its occupants.
Vitruvius’s six fundamental concepts fall into three groups:
1. *Ordinatio, eurythmia* and *symmetria* denote the various aspects of the proportions
of a building.
2. *Dispositio* refers to the artistic design, for which *cogitatio* and *inventio* are necessary.
3. *Decor* and *distributio* concern the appropriate use of the Orders and the relationship
between house and occupant.
Vitruvius sees proportion as a prerequisite for *ordinatio, eurythmia* and *symmetria,*
but does not define it when he introduces these concepts.49 For Vitruvius proportion
is not an aesthetic concept; it is purely a numerical relationship, not the effect arising
from its application. Vitruvius’s key statements on proportion are contained in the list
in the first chapter of Book III, in which he broaches the subject of temple-building.
The planning of temples is based on symmetry, to whose laws architects must
conform with painstaking exactitude. It derives from proportion, which the Greeks
call *analogia.* Proportion is present when all the parts and the building as a whole
are based on a selected part used as a measure [commodulatio]. From this
symmetries are calculated. For without symmetry and proportion no temple can
have a rational design, unless, that is, there is a precise relationship between its
parts, as in the case of a well-built human body.50
In this passage architectural proportion is defined in three ways:
(i) By the relationship of the parts to each other.
(ii) By reference of all the measurements to a common module.
(iii) By analogy with the proportions of the human body.

This laid the seeds of the dual form of the concept of proportion, which has
largely dominated discussion of architectural theory ever since Vitruvius: proportion
as a relationship of absolute numbers, and proportion derived from analogy with the
human body—anthropometric proportion.

Next, Vitruvius lays down fundamental rules of proportion for the human body,51
according to which the length of either the face or the nose—three nose lengths being
equal to one face length—is taken as a module. He applies these anthropometric
proportions to painting and sculpture, but goes on immediately to say: "Similarly, the
parts of temples must be in complete and harmonious proportion to the whole, which
is the sum of those parts."52

In the sentences that follow, Vitruvius attempts to combine the human body and
the geometrical forms of circle and square, and thus to establish a connection between
man, geometry and the number. So-called 'Vitruvian man' is thus described in this
passage:

Similarly, in the human body the central point is naturally the navel. For if a man
lies flat on his back with arms and legs outspread and a circle is described with
the point of a compass placed where his navel is, the fingers and toes of his hands
and feet will touch the circumference of the circle. And just as the human body
will give a circle, it will also give a square. For if we measure from the soles of the feet to the top of the head and then compare that measurement with the span of the outstretched arms, width and height will be found to be equal, as in an area set out with a builder's square.\textsuperscript{35}

The graphic interpretation of this figure or figures has preoccupied nearly all commentators on Vitruvius. We shall return to this point later.

In order to substantiate the connection between the proportions of the human body and numbers, Vitruvius claims that all measurements (inch [finger], palm, foot and cubit [forearm]) are derived from the human body and that ultimately the perfect number ten, the decimal system, corresponds to the number of fingers (cf. also the fact that Vitruvius's books are ten in number). Vitruvius takes the number six to be another perfect number. The sum of the two perfect numbers, ten plus six, makes, he states, of sixteen the most perfect number of all.

At the end of the chapter, Vitruvius sums up as follows:
Hence if it is agreed that number is derived from the parts of the body, and that there is a correspondence between the various parts of the body and its overall form in fixed proportion, it follows that we must acknowledge our debt to those who, in constructing temples to the immortal gods, so ordered the parts of their buildings that by means of proportion and symmetry the arrangement of both the separate parts and the whole design should be harmonious.\textsuperscript{36}

Nowhere does Vitruvius give a general theory of proportion with numerical values. Only when he is describing the 'genera' of temple types (IV:i)\textsuperscript{37} does he offer concrete proportional numbers, which again are substantiated by analogy of columns with the human body. Thus the Doric column is supposed to correspond to the male body, taken as six feet high; hence the height of the Doric column, including the capital, should be six times its lower diameter. In accordance with the proportions of the female body, he gives the ratio of one to eight (lower diameter to height) for the Ionic column, adding, however, that both Orders were given more slender proportions in later periods: the Doric one to seven, the Ionic one to nine.

It must be noted that the so-called Orders in the sense of the Renaissance canon do not feature in Vitruvius's writings. The concept of Orders represents a systemisation undertaken after Alberti, which has ever since been identified with Vitruvius's genera.\textsuperscript{38}

In Vitruvius, proportions have empirical values derived from the human body, i.e. not absolute values. Hence in considering proportional relationships in private houses, Vitruvius can recommend deviations from proportion to take account of optical distortions (VIII:i):

Where therefore the system of symmetries has been decided on and the dimensions worked out by calculation, then [the architect] must use his judgement to make special provisions for the nature of the site, either in its use or appearance, by making modifications [temperaturas], so that by additions or subtractions made to its proportions [symmetria] the building appears correctly shaped and nothing is lacking in its final aspect.\textsuperscript{39}

It must be noted that in his treatment of individual building-types Vitruvius loses sight of the fundamental concepts and aesthetic principles he has worked out in the second chapter of Book I, which he had claimed to be universally binding. The conceptual structure seems to be superimposed; Vitruvius did not feel the need to
apply his criteria to specific buildings or types of building. Thus one cannot speak of a unified or systematic architectural theory in Vitruvius, except in a very limited sense.

Vitruvius's statements on particular aspects of building and existing structures, which make up the main body of his treatise, are of particular importance for archaeology, but are also of great significance in the subsequent history of architecture. From the moment of his canonisation in the Renaissance, his treatise was consulted for countless building projects and, misunderstood to a greater or lesser degree, exerted enormous influence over built architecture.

Any description of Vitruvius's 'system' can largely omit his discussion of the practical aspects of building, so that his 'rules of building' need not be summarised here. However, all such discussion in Renaissance and baroque treatises must be understood against the background of Vitruvian statements. In specific cases it is thus necessary to refer back to Vitruvius's text.

Clock-making and the construction of machinery, regarded by Vitruvius as branches of architectural theory, were looked upon up to the Renaissance as a single category.

Literature
