Fig. 1. The circle of the winds, Book I.
(Collection Woodward Library, University of British Columbia)
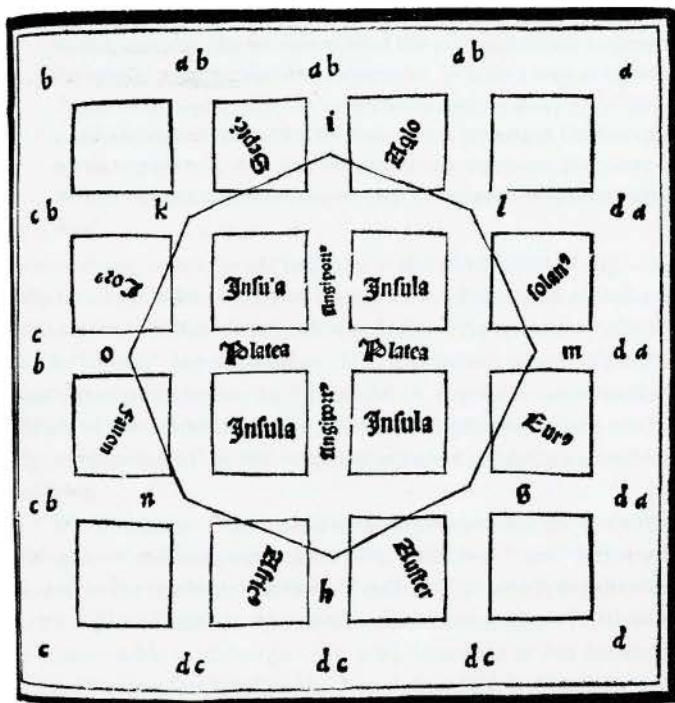


Fig. 2. The orientation of streets, Book I.
(Collection Woodward Library, University of British Columbia)

*Daniel Millette is a Ph.D. candidate at the University of British Columbia. This article earned the Martin Eli Prize of the SSAC in 1999.*

D a n i e l   M i l l e t t e

# On Illustrating the Oldest Architectural Book: Sketches and Mnemonics in Vitruvius's *De Architectura libri decem*

## Introduction: Textual, visual and memory sketches

The compulsion to illustrate copies and translations of the *De Architectura libri decem* of Vitruvius seems irresistible.[1] Scholars and erudites continue to produce versions of the treatise with drawings to complement passages, diagrams to elucidate design tenets and plans to check the old architect's descriptions. Just as Caesar Cesariano's (1483-1543) translation of 1521 contains a set of highly imaginative visual depictions for example, so too does Morris Hicky Morgan's translation of 1914 include an assemblage of figures; the latter includes no less than sixty-one photographs, plans and assorted *schemas*. Illustrations also accompany the recently published English translation of Ingrid Rowland and Thomas Howe.[2] The difficulty of course, is that the reading of the text, regardless of philological accuracy, can be significantly altered by visual representations; as architectural historians, theorists and practitioners continue to arbitrate *the classical* through the treatise, the text's interpretive essence becomes even more significant when new pictorial dimensions are added.

> **"These three (plan, elevation and perspective) arise from imagination and invention."**
> (Vitruvius, I, 2.2)

> **"[I]f a fixed centre is taken for the outward glance of the eyes and the projection of the radii, we must follow these lines in accordance with a natural law, such that from an uncertain object, uncertain images may give the appearance of buildings."**
> (Vitruvius, VII, preface, 11)

It seems somewhat of a paradox that while the *De Architectura libri decem* was devised to appeal to those interested in architecture and the building crafts, few visual elements seem to have been included to complement the initial textual depictions. The resulting interpretive difficulties are compounded by the fact that the few sketches that did supplement the treatise are no longer extant. On the one hand, the generalized descriptions become

Fig. 3. The design of *entasis*, Book III.
(Collection Woodward Library, University of British Columbia)
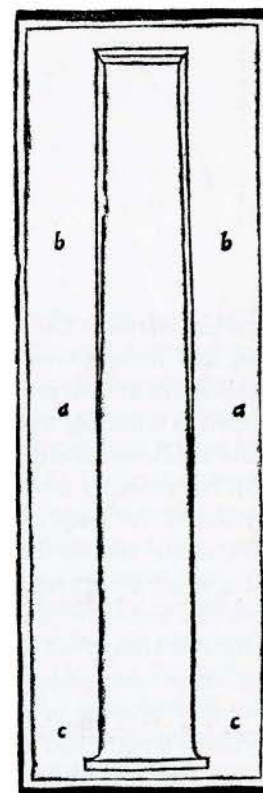


compelling and immediate because the reader can fill-in what is missing: The reader participates in imaginative constructions, combining personal familiarity and cumulated and learned histories with the ideals of Vitruvius's universal tenets. But on the other hand, as soon as illustrations are produced and initially liberate the imagination, they also etch the former along a new imaginary track and bind it to a particular rendition. Inevitably the pictorial renditions force the reader's textual to *fit* the visual.

Vitruvius chose to elaborate few passages visually, quite deliberately omitting graphic displays of buildings, for example.[3] Only a handful of drawings were provided to complement some of the *scientific* notions and formulaic design features that were, for the most part, paraphrased from others. Yet as an architect he would surely have been familiar with the power of the diagrammatic: he had perused the illustrations supplementing the texts of other writers like Aristotle,[4] he would have had knowledge of the design *croquis* sometimes inscribed upon the surfaces of monuments,[5] he was aquainted with drawing techniques,[6] and he was familiar with the drawings and plans that he explicitly recalled, for example, in Book V (V, 8.2). Why then did he provide so few illustrations within the *De Architectura libri decem*? In this paper, the illustrations of the *De Architectura libri decem* will be explored. These, as will be shown, include more than sketches; they embody drawings, mnemonics and images teased out of the Roman collective memory and usurped by Vitruvius in re-defining the architectural discipline.

**Visual sketches**

What can we tell about the illustrative material provided by Vitruvius when the original figures are no longer extant? From the treatise there appear to have been some ten schematics:[7] The circle of the winds and the orientation of streets contained in Book I (I, 6.12),[8] the notions of *entasis/scamilli impares* and the design of ionic volutes in Book III (III, 3.13; 4.5; 5.8), the harmonic limits to musical notes referenced in Books V and VI (V, 4.1; V, 5.6; VI, 1.7), the *chorabates* in Book VIII (VIII, 5.1-3), the geometric replication of the square and Pythagoras's triangle, both in Book IX (IX, preface, 5, 8), and finally, the positioning of Archimedes' screw in Book X (X, 6.4). With the possible exception of street orientation, these would not have been particularly straightforward ideas to convey. Nor would they necessarily have been readily conceptualized by readers; the complexities, formulaic properties and abstract notions of these concepts lent themselves particularly well to the diagrammatic.[9]

The first mention of a drawing is contained in the long set of verses elucidating the circle of the winds in Book I. Interestingly, this section takes up most of the chapter devoted to street orien-

tation, underscoring the important preoccupation with climatology as it relates to salubrity and, more generally, geography as it applies to urban siting. The notion of "wind" dominates the chapter while "street layout" is only gradually explicated. First, Vitruvius cites Mytilene as a poor example of urban planning, recording that "in this city when the South wind blows men fall ill […]" (I, 6.1).[10] Then the "Four winds" are described, followed by the "Eight winds," with the more complex arrangement of the "Twenty-four winds" developed a little later (I, 4-5, 10-12). The passage becomes increasingly difficult as the name of each wind and calculations of the earth's circumference are interspersed without any apparent direct relation to orientation. The whole begs for illustrative clarification and this is probably why Vitruvius inserts a *forma*.

The section relating to the disposition of streets is equally blurred, especially within the short passage where the author prescribes how the winds should, as much as possible, be broken-up by the streets. The verses are difficult to follow and without a visual device to complement the text, the reader is literally forced to trace one out as the lines are read. Probably recognizing this, Vitruvius adds designating letters to link the points of the text to those of a sketch. Thus, "between Auster and Africus there will be H, between Africus and Favonius N, between Favonius and Caurus O, between Caurus and Septentrio K […]" (I, 6.13). A second *croquis* — directly linked to the first one — is therefore provided by Vitruvius.

The next pictorial is that which outlines *entasis*, the slight outward curve given to columns in order to correct the illusion of concavity occurring along the length of the columnar shaft. The technique had been previously developed by the Greeks and this may be why Vitruvius gives no formulaic account for calculating the correct convexity-to-height ratio in the text. Presumably this is covered in the diagram, where "an illustrated formula […] is furnished" (III, 3.13). Without a chart or model, it would not have been possible for the reader to outline how the *entasis* ideal could be achieved accurately.

As with *entasis*, *scamilli impares* also requires a formulaic approach. The meaning of *scamilli inpares* — a term not found anywhere else in the literature of antiquity — has been debated throughout the *De Architectura libri decem's* philological life.[11] The

19

problem relates to the optical illusion resulting as the relatively long and straight lines of horizontal stylobates appear to bow downwards at their center. The *scamilli* would presumably have helped in offsetting the illusion and may have been the ensemble of small step-like forms designed within the stylobates. It may also have been a device used to render lift at the center of stylobates. We simply do not know. What seems certain, however, is that the *scamilli* of Vitruvius are intended to be something which act in a similar fashion as *entasis,* but with the temple stylobate somehow pushed upwards at its centre as opposed to column shafts curved outwards.[12] Regardless of the exact meaning, Vitruvius appears to have been forced to present a diagram, probably because of the sliding scale involved in differing stylobate lengths and temple proportions.

A little later in the same book, Vitruvius refers to another illustration in discussing the design of ionic volutes: "At the end of the book [...] a diagram and formula will be furnished for the drawing of the volutes as they may be correctly turned by the compass" (III, 5.8). A volute, of course, would not have been difficult to define for the architect. But the proportionately precise development of the spiral scroll would have been key in obtaining the graduated effect of the column capital of the Ionic order. Again, a textual description does not suffice and Vitruvius provides the builder with an explanatory sketch.[13]

The depiction related to harmonic ranges seems somewhat distant from what would today be part of building practice. The topic is included in setting out the limits to musical notes as they relate to sounding vessels in theatres; theatre designers would have had to provide specially adjusted vessels within pre-determined niches located at strategic points in the *cavea*. The writer makes three references to this diagram (V, 4.1; V, 5.6; VI, 1.7). Here Vitruvius is dealing explicitly, although perhaps not exclusively, with someone else's work: Aristoxenus. Judging by the complexity of arrangement according to theatre size and vessel location, it is easy to see how he would require a visual depiction to complement the discussion. He thus adopts the sketch of Aristoxenus.

The next reference to a graphic representation is linked to the *chorabates* in Book VIII. The *chorobates* is a wooden, bench-like levelling device, built with a water-filled slot along its center. Its use — and thus its design — is key for construction projects extending beyond the aqueducts that Vitruvius is dealing with in this particular section. While its practicality is certainly problematic — it is difficult to ponder how the apparatus could be properly installed in inclined terrain, for example — Vitruvius presents the implement as indispensable; no other construction tool is given as much attention.[14] He thus chooses to provide an assembly drawing to complement the text.
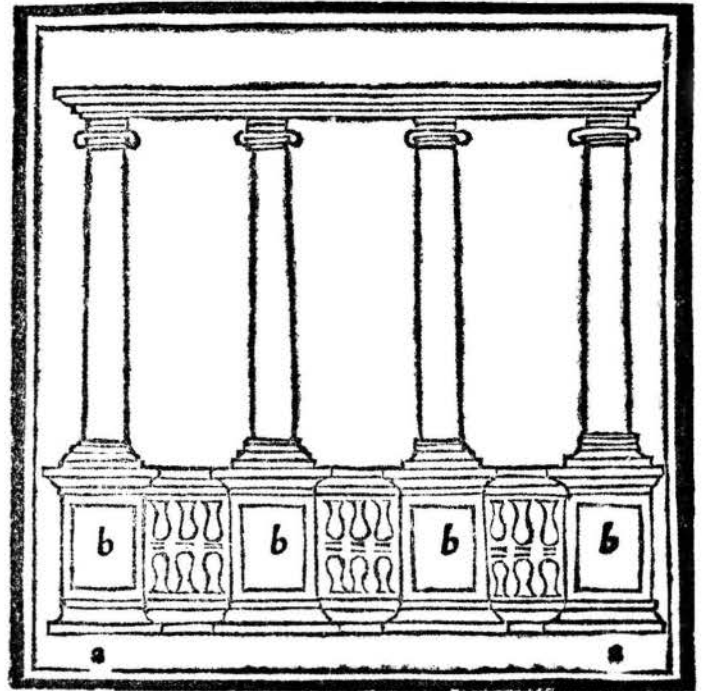
Vitruvius's recourse to external sources is certain. In Book IX, for example, he evokes the work of Plato; he is probably paraphrasing the latter in delivering his description of the geometric replication of the square. He gives a "demonstration" by doubling a one-hundred square foot cube, echoing Plato's idea in a long-winded and indirect passage (IX, preface, 4-5). It may in fact be because of the indirect explanation that the whole becomes problematic. For clarity, the writer is forced to provide an *examplar*.

In a similar passage, the principles of Pythagoras are recalled (IX, preface, 8). Again, Vitruvius is using someone else's theory, this time within a prescription for stair design. The communicative difficulty is related to the preceding one where the description lends itself readily to geometry and not easily to text:

> For if the height of a story from the flooring above to the level below is divided into three parts, five such parts will give the inclined string of the staircase in its exact length. Taking the height between the floor above and the level below as three parts, let four parts be set off from the perpendicular and let the foot of the string be placed there. This will be so adjusted; so also will be the plotting out of the several steps of the staircase itself. The drawing of this, also, is subjoined (IX, preface, 8).

The visual is textually conveyed yet remains incomplete without a diagram. The author must have realized this and complemented the passage with a sketch.

The last mention of a drawing is made in Book X, where the architect outlines Archimedes' screw (X, 6.4). It is interesting that he links the positioning of the screw to the Pythagorean triangle earlier presented in Book IX: after characterizing the water screw, Vitruvius sends the reader back to the previous book in prescribing its installation. Fleury suggests that the two resulting diagrams may be the same; this is not assured, however, as the architect seems to be making reference to an independent sketch
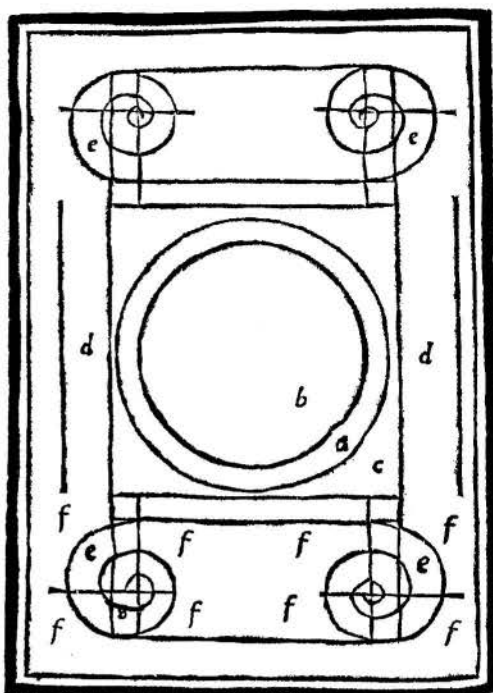
which would contain the screw itself.[15]

Thus we have an approximation of the *De Architectura libri decem's* illustrations. Significant is that these are not building depictions, measured drawings or construction details *per se*; they are instructional *formas* provided to complement rather complex textual descriptions of mostly quasi-*scientific* notions with very broad technical or building applications. At first glance, Vitruvius seems to be completely rejecting the idea of the architectural illustration. Perhaps he feels he can rely on the use of models from his landscapes — the monuments of Republican Rome that exist on the one hand within the collective memory of Romans, and on the other, within their *present* lifeworld — to trigger the imagination and thus figuratively illustrate the treatise.

**Memory sketches**

The notion of collective memory is a complex one. It is at once historical and traditional, all-the-while closely related to identity. As Maurice Halbwachs so eloquently put it, "collective memory lies where tradition ends and history begins."[16] Halbwachs's words apply to today, but for the Romans of Vitruvius's day, tradition is bounded to memory and does not necessarily end as histories are written. It contains histories and realities expressed, for example, in the building images and monuments that fill lived and imaginary landscapes. Vitruvius alludes to a collective memory when he mentions *memoria* at numerous intervals in Books I, III, V, VII, IX and X. He points to *memoratur*, or remembering, at equally sporadic moments in all books except I, V and VI. And in Book I, he evokes memory as he refers to his own "zeal [...] which had remained faithful to [the emperor's father's] memory" (I, preface, 2) before mentioning that the emperor's monuments were "a memorial to future ages" (I, preface, 3).

Vitruvius is fully aware of the posterity, legacy and meaning of Republican landscapes — especially built landscapes. And in this light, he is cognizant of the collective memory, the recording of history, oral or otherwise, and the reliance on tradition. The three are in fact juxtaposed within his notion of *the old ways*.

Still in Book I for example, he underscores the importance of the architect keeping track of "useful precedents" (I, 1.4) and remembering historical antecedents (I, 1.5). In Book II, he notes the importance of the *memorentur antiquitus*, his own antiquity (II, 6.2-3), and in Book VII, he reminds the reader of previous textual and memorized works (Book VII, preface, 1-2, 7). The frequent mention of "memory" and "the past" would lead the reader to expect the use of specific references to the monuments of Vitruvius's antiquity as examples. Rome, after all, is filled with memory-sites ready to be selected for whatever intent. By pointing to known monuments and buildings of Rome and Italy he would have no real need to provide illustrations. He does this in Book II as he recalls the temples of the citadel (II, 1.5), in Book III with the monuments located in Caesar's forum (III, 3.2) and in Book VII as the temple of Flora is evoked (VII, 9.4). But the strategy seems to end there, and while memory-sites fill the treatise, they are for the most part, external to Italy.

Often coupled with listings of Greek *experts*, the memory-sites of Vitruvius are mostly Greek, including the large number of temples in Books II and VII, as well as the majority of all other building examples of the dissertation. In fact, less than ten percent of the memory-sites included in the *De Architectura libri decem* — temples, city walls, palaces and so on — are Roman. One might be tempted to conclude that Vitruvius is simply aspiring to Greek architecture and therefore chooses Greek models. Perhaps so, but while Vitruvius deliberately channels the reader's imagination towards Greece, the exemplars are still not included as drawings. They remain vague, especially when considering that most of the intended readers — and perhaps Vitruvius — may not have actually visited the spaces and thus might have no immediate recollection or imaginary template from which to draw a mental or material sketch.[17] Why does he do this?

For one thing, Vitruvius is contending with the repertoire of images — and their associated meanings — pre-loaded within the minds of Romans. While he is conscious of the Roman builder's collective memory, he knows he cannot alter it by simply drawing a new set of illustrations; as above alluded to, the Republican architectural memory is mired in histories, traditions and identities that cannot be readily changed. The accepted models derive from long-standing traditions that, albeit derived from other sources that include Greece, have become engrained in the construction *modi* of Rome. Vitruvius wants to alter the models and modi. And he must also contend with another reality: he is living in a time and place where a single individual — the emperor — is transforming the landscapes of Rome according to his own likes and dislikes. Thus on the one hand the architect must be subtle in his critiques and recommendations — he is,

Fig. 6. The harmonic limits in musical notes, Book V.
(Collection Woodward Library, University of British Columbia)
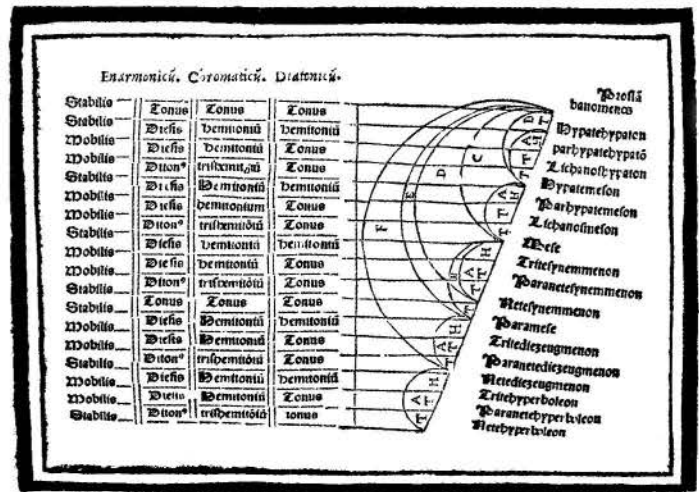
after all, beneficiary of a pension from the emperor's sister[18] — while on the other hand, he has somehow to persuade builders and patrons that change in the discipline is possible and indeed, necessary. More importantly perhaps, Vitruvius does not aspire to replicating Greek architecture; he is drawn to it but wants to adapt it to his notion of Roman *Architectura*.[19] Thus, instead of direct examples, he uses spatially and temporally distant cases that leave out exactitude yet recall specific and accepted notions of *the old ways*.

When he turns to the temple of Diana at Magnesia (III, 2.6) in his discussion of the *pseudodipteros* temple, for example, Vitruvius would surely have been aware that the majority of his readers would not have visited the place. The use of distant and thus indefinite prototypes allows Vitruvius to insert his prescriptions within an acceptable framework. Greek architecture is recalled — the *old ways*, so-to-speak — while Roman architectural detail is constructed according to Vitruvius's "new way." This of course does not help him in terms of illustrating his set of architectural histories, meanings, ideals and more precise tenets. To do this, he turns to a further device: the mnemonic tale.

As *raconteur*, Vitruvius is working with knowledge and appreciation of rhetoric, the art of persuading within an eloquently planned oratory; most disciplines of the day employ some form of the style. To be effective, the rhetorical enticement must be prepared in advance and memorized, usually with the help of a set of mnemonics. The idea then is to develop ways of remembering. One such method involves the organization of places in the mind — *loci* — where images are imagined, stored and ultimately retrieved as needed within the development of the narrated speech.[20] A mental topography results, within which mnemonics operate as cues much like those of a roadmap would alert one to the topography ahead.

Related to the notion of memory-places, the mind of the Roman architect is also occupied by sets of *loci*. As earlier alluded to, the builder possesses a set of pre-loaded mental images that makes up part of the collective architectural memory — what is observed within the day-to-day and what is crafted within various building projects. And complementing these were the orally-transmitted tenets and rules that would have been passed down as part of the training and apprenticeship processes. While there is undoubtedly a certain amount of note-scribbling taking place, memory remains key: students *remember* design rationale, architectural elements, construction details and building examples with the help of memory aids. Thus the notions around rhetoric and the mnemonic *loci* are well engrained in the learning experience. With the popularity of rhetoric and the oral, memory-based

learning tradition, it should not be surprising that the *De Architectura libri decem* contains mnemonics that channel thoughts through precise tracks towards specific sets of *loci* within the reader's imagination. Recall, however, that Vitruvius does not necessarily aim at *replicating* architecture; he thus has to select *loci* that are not part of the formal, pre-loaded examples contained within the collective memory of his readers. More importantly perhaps is once the *loci* are installed within the reader's memory, Vitruvius must be able to tune these memory-places to his preferred historical and technical tenets.

One mnemonic that is not necessarily part of the collective memory and that can be readily shaped is the scripted myth. Consider Vitruvius's tale of the first house: In his Book II, Vitruvius turns to the primal shelter to elucidate his theory on the origins of architecture (I, 1.1-2, 4). He tells the reader that after being "[t]errified by the raging flame" of a haphazardly occurring fire, people recognized the advantages of maintaining it and grouped themselves around its warmth (II, 1.1). Speech evolved from the inevitable social interaction. People then began constructing shelters in the form of cave-like trenches, twig and nest-shaped structures, and ultimately, huts. Finally, mutual learning, competition and cumulative personal knowledge facilitated increasingly complex constructions (II, 1,2,4).[21] Vitruvius offers a *proof* for his theory by pointing the reader to the straw and mud "Hut of Romulus" on the Capitolium (II, 1.5). The legend is evocative and its legacy endures.[22] It underwrites a founding historical myth that is meant to exclude any other theory of architectural roots that may be lurking in the reader's imagination. The writer gives the reader a history and rationale for the discipline, all-the-while rendering a tectonic visual. Even if the myth is partly recalled in some other pre-existing form by the reader, Vitruvius re-aligns it. The vignette is presented within an authoritative, authentic and legitimate mode, setting the tone for what Vitruvius is about to recite; that is to say, his "theory" of *Architectura*.

The use of the myth as substitute for elaborate illustration is further exemplified by the tale of the origin of the caryatid. In Book I, Vitruvius makes the case for a comprehensive architectural education and underscores the importance of knowledge of history (I, 1.4-5). He gives an example of the importance of such erudition when he highlights the meaning attached to the

use of particular architectural features. He writes: "if anyone in his work sets up, instead of columns, marble statues of long-robed women which are called caryatids, and places mutules and cornices above them, he will thus render an account to inquirers" (I, 1.5). He then recounts the legend of the people of Caria who had conspired with Persia against Greece and lost. The women of Caria were subsequently taken into slavery, led away in full aristocratic dress to reinforce the triumph of the conquering Greeks. Architects memorialized the event by constructing embodied columns "placed to carry burdens" (I, 1.5). Upon reading Vitruvius's account, the reader immediately recognizes the meaning of the "caryatid" and assimilates its very specific design features within the personal imagination. Form, use and meaning are transferred from myth to design. A similar saga is furnished for the *telamones* in Book I (I, 1.6-7) and later in Book VI (VI, .6) with the story of Atlas supporting the firmament. The historical myth rationalizes the "appropriate" use of specific architectural components, equipping the imagination with detailed spatial outlines. No actual drawing is required.

A similar example is found in Book III (1.3-6) where Vitruvius recounts the birth of the Doric order:

Dorus, the son of Hellen […] by chance built a temple […] when as yet the exact proportions of the order had not begun […]

Afterwards the Athenians […] founded thirteen colonies in Asia at one time […] and established […] sanctuaries of the immortal gods […] First, to Panionian Apollo they established a temple as they had seen in Achaia […] When they wished to place columns in that temple, not having their proportions, and seeking by what method they could make them fit to bear weight, and in their appearance to have an approved grace, they measured a man's footstep and applied it to his height. Finding that the foot was the sixth part of the height in a man, they applied this proportion to the column. Of whatever thickness they made the base of the shaft they raised it along with the capital to six times as much in height. So the Doric column began to furnish the proportion of a man's body, its strength and grace (IV, 1.3-6).

While taking a rather circuitous route, the narrative reminds the reader that the Doric column is to be proportioned according to the human male. And while the tale highlights that "proportioning" is crucially important, it also reinforces the notion that the ways of the ancestors are to be respected. In other words, these are not whimsical instructions to follow; they are — to Vitruvius — precedents that have been set in the past and are to become part of a "new" architectural memory. Vitruvius undertakes a similar elucidation with the woman's body as representative of the Ionic order and the maiden figure corresponding to the Corinthian order (IV, I 7-9). The myth is remembered as
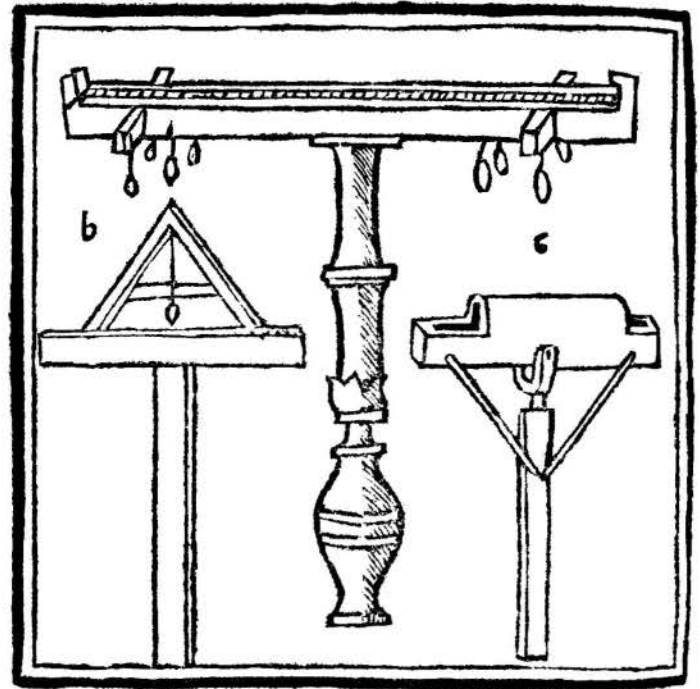
"historical fact" and transferred to the memory to be eventually transformed into architectural design tenet. Within this *modus* the readily visualized and remembered human body is a recurrent theme.

The tale of Dinocrates in Book II has a different function. The architect recalls how Dinocrates made a successful attempt to catch King Alexander's attention in order to obtain a commission. The king delights in Dinocrates' proposal — here Dinocrates has just proposed the topographic transformation of Mount Athos into a colossal figure — but cannot provide a suitable site for the project. The king tells Dinocrates that "just as I think your *planning* worthy of approval, so, in my judgement, the *site* is worthy of disapproval" (II, preface, 3).[23] The king invites the ambitious architect to follow him to Egypt, where the planning of Alexandria is eventually commissioned to Dinocrates. The idea behind the tale, of course, is to highlight the importance of the site. As with the recounting of other myths, Vitruvius tames the intuition and imagination, prescribing his planning and siting priorities for the reader to assimilate.

Complementing the myths are recounted stories that have within them some elements that rely — at least partly — on fact. The story of the people of Larignum in Book II is such a case. After listing various kinds of timber, Vitruvius arrives at his example of the larch tree (II, 9. 14-17). He begins by describing the tree and then turns to a story to highlight its superior qualities. In the story, Caesar and his army are in the Alps near the settlement of Larignum where the inhabitants have refused to provide the requested tribute. Caesar decides to attack the walled settlement that happens to be protected by a high tower made of the said wood and, attempting to burn the tower, the flame-retardant quality of the larch is observed. Caesar eventually captures the town and the wood is transformed into a commodity. From "Larignum" is derived "larch"; the town's name thus becomes a mnemonic for the tree just as the battle is for its fire-resistance quality.
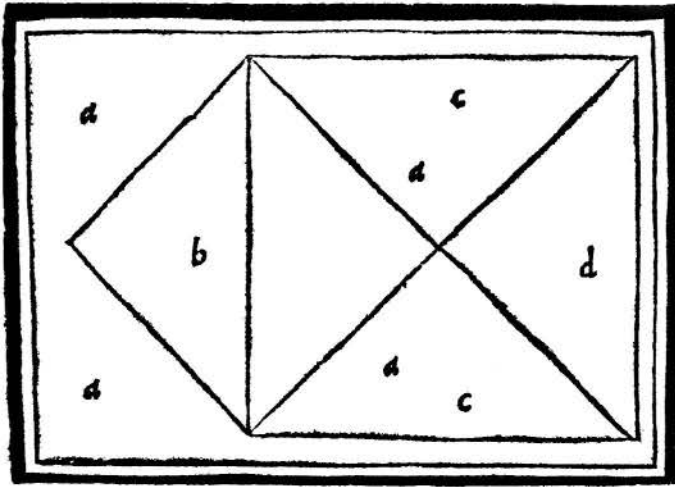
Fig. 8. The geometric replication of the square, Book IX.
(Collection Woodward Library, University of British Columbia)

Another tale evoked by Vitruvius is that of the siting of Halicarnassus, or Halicarnassus-as-theater in the landscape. We find the note in a section in Book II where Vitruvius discusses various masonry types and highlighting the superior quality of sun-dried brick (II, 8.10-15). Among other examples, the author cites the use of such brick at the palace of Mausolus, King of Caria during 377 to 353 B.C. (II, 8.10). Consider the passage describing the site:

> [The King] observed at Halicarnassus a place naturally fortified, a suitable market, and a useful harbour, and he there established his palace. Now that place is like the curvature of a theatre. The forum is placed at the lowest level along the harbour. But about the middle of the natural amphitheatre and, as it were, in a cross gangway, a street is constructed of ample width, in the middle of which the Mausoleum is built of such splendid workmanship that it is named among the seven sights of the world. In the middle of the top of the citadel is a temple of Mars having a statue of a colossus with marble extremities made by the famous hand of Leochares [...] On the right wing at the top is a temple of Venus and Mercury against Salamacis' fountain itself (II, 8.11).

Within a technical exposé on masonry, Vitruvius moves to the siting of the Mausoleum — one of the Seven Wonders of the ancient world — to the local topography, and finally to the various monuments dotting the city.[24] A few more details are contained in a later passage:

> For just as on the right side there are the temple of Venus and the spring [...], so on the left wing is the royal palace which king Mausolus had built to his own plan. From it there is seen on the right side of the forum and harbour and the whole circuit of the walls; under the left there is a secret harbour lying hid under high ground, in such a way that no one can see or know what is going on in it, so that the king from his own palace could see what was necessary for his sailors and soldiers, without anyone else knowing (II, 8.13).

We know of course that there are difficulties with the site description.[25] Clearly Vitruvius is turning to the example to outline an ideal; he is narrating and mapping a landscape of power, complete with exclusive vantage points, secret topographies, a palace wonder-site and a series of additional memory-sites that include a set of specifically situated monu-
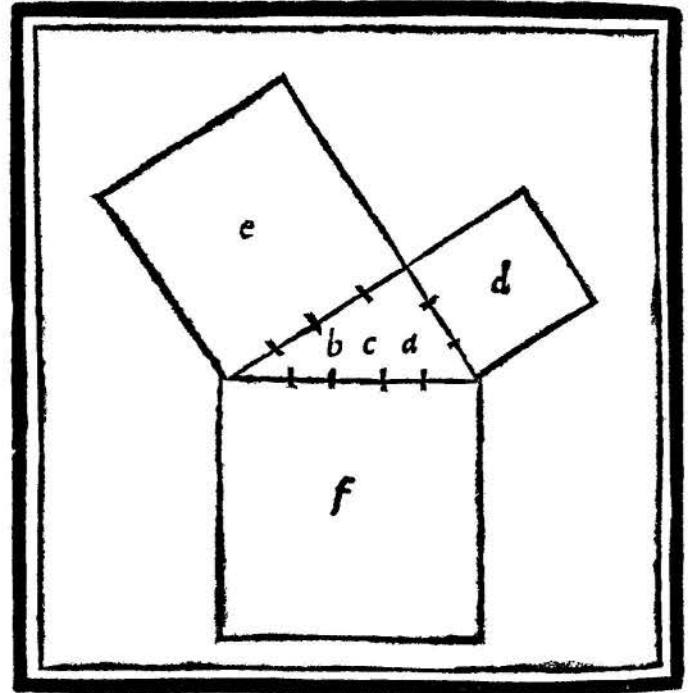


Fig. 9. Pythagoras's triangle, Book IX.
(Collection Woodward Library, University of British Columbia)

ments. No actual drawing is required. The story has a potent quality that inscribes norms, rationale and a coded "siting" landscape onto the imagination.

Mythic tales and histories are not the only imagination-triggering devices that Vitruvius uses as illustrations. As alluded to earlier, the human body is effortlessly retrieved from one's memory. From the onset of the treatise, the writer's use of the body image, especially within his proportioning scheme, is central:

> For Nature has so planned the human body that the face from the chin to the top of the forehead and the roots of the hair is the tenth part; also the palm of the hand from the wrist to the top of the middle finger is as much; the head from the chin to the crown, an eight part; from the middle of the breast to the crown, a fourth part; a third part of the height of the face is from the bottom of the chin to the bottom of the nostrils to the line between the brows, as much; from that line to the roots of the hair, the forehead is given as the third part (III, 1.2).

> Now the navel is naturally the exact centre of the body. For if a man lies on his back with hands and feet outspread, and the centre of a circle is placed on his navel, his figure and toes will be touched by the circumference. Also a square will be found described within the figure, in the same way as the round figure is produced (III, 1.3).

Here Vitruvius etches the imagination with the image of the male body as governor of a proportioning scheme. The schema is readily conceptualized by the reader, as it would be later by so many Renaissance interpreters. The evocation of the body has the same effect as a set of diagrams — perhaps stronger — but with an added result: while it frees the imagination, it does so along a certain prescribed track. The reader not only constructs a personal sketch from the description, but just as significantly, this is done to the reader's self image. No drawing is required.

Fig. 10. The water screw, Book X.
(Collection Woodward Library, University of British Columbia)



By the time Book V is attained, the *architectus* is attributing much greater importance to his work. It is perhaps in this light that he develops an all-encompassing mnemonic. This time the memory device is intended for the *De Architectura libri decem* itself. In the preface to Book V, we find a direct conduit into Vitruvius's mind when he commits to paper his thoughts on the learning process of his fellow builders:

> And while I enumerate, in accordance with the parts of buildings, the obscure terms and measurements, I will expound them briefly so that they may be remembered. For thus the mind will be able to receive them more conveniently. None the less, perceiving the state to be overstrained by public and private business, I decided that I must write briefly so that the reader might understand in his scanty leisure.

> Pythagoras also […] decided to write [his] rules, cube fashion, in [his] volumes, and fixed upon a cube — 216 lines — and [he] thought that not more than three cubes should be in one treatise. Now a cube is a body with all its sides squared and their surfaces equal. When a cube is thrown, on whatever part it rests, it retains its stability unmoved so long as it is untouched, like the dice which players throw in a tray. Now this analogy they seem to have taken from the fact that this number of verses, like a cube upon whatever sense it falls, makes the memory there stable and unmoved (V, preface, 2-4).

Thus the cube becomes a mnemonic for the entire treatise.[26] To the writer — as with Pythagoras — each side of the cube is to have no more than 36 verses (216 divided by 6 sides). The rationale behind this is that as the squared cube remains stable, regardless of what side it lands upon, so too is a treatise — anchored in the reader's memory — provided it is composed of the proper amount of verses. Puzzling is that while this is intended to be a perfect model, Vitruvius does not follow it; the number of verses in the *De Architectura libri decem* has no correlation to Pythagoras'*scube*[27]. What remains, however, is the image of the cube representing the treatise. The cube mnemonic seeks to catapult the treatise itself into the collective memory of Romans.

**Conclusion**

What can we conclude from Vitruvius's textual and visual sketches? Well, he certainly wanted less of the visual: only ten basic illustrations were provided. These sketches may not have been his own and he may have included them as part of paraphrased passages. They certainly tended to complement difficult concepts not necessarily related to specific buildings. In terms of images for his architectural examples, he chose few Roman cases and deliberately included temporally and spatially distant Greek models. The ambiguity created by turning to distant examples allowed for a broader interpretation of his *Architectura*: the reader would have retreated from the personal *vécu* and reassembled an architecture based in part on the vague images. Vitruvius turned to imaginary *diagramma* that forced his readership to re-trace memory paths. To deliver specific rationales, particular design details and "new" architectural principles, the architect tamed the imagination of his readers by providing new memory-places. He established credibility, lucidity, and with mnemonics, relatively easy ways of remembering his issues of priority all-the-while installing these within the mind as sets of *loci*. As Vitruvius narrated myths, he amplified knowledge and rendered authority to his text. He was conscious of the visual and intellectualized repertoire of symbols in his lifeworld and therefore selected his "illustrations" with this in mind, excluding any memory-place that would have opposed his theoretic. By being selective in his use of prototypes and in his choice of histories, geographies, places, spaces and tales, he was reorganizing the collective architectural memory of Roman builders.

The *De Architectura libri decem* includes memory cues that served as the bits Vitruvius required in presenting his *Architectura*. The illustrative narrative is highly imaginative, simultaneously descriptive and normative, all-the-while both historical and "theoretical." The *architectus* was writing in a time and place where building practice was transmitted orally; memory aids routinely supplemented graphic portrayals. As mnemonics, the aids would have had illustrative qualities akin to sketches, also setting the readers' imagination along specific tracks. And while the tracks led away from Rome and appeared to navigate towards the Hellene, they did not necessarily lead directly to Greece. The *Architectura* of Vitruvius was to be a re-aligned and re-designed discipline. In this light, it may be argued that the perpetual re-illustrating of the *De Architectura libri decem* blocks the imagination and thus defies the purpose of its author.

## Notes

1 An earlier version of this paper was presented at the Annual Conference of the Society for the Study of Architecture in Canada in May 1999. The author wishes to acknowledge Dr. Sherry McKay at the University of British Columbia School of Architecture for guidance, and the Canadian Centre for Architecture in Montreal for access to its manuscript collection. The illustrations are from the Vitruvius *Iterum Florentiae* of Sumptibus Philippi de Giunta (1513 edition); they correspond, roughly, to what are thought to be the ten *schemata* offered by Vitruvius. The 1513 edition is located at the University of British Columbia Woodward Library; the author is grateful for the library facilitating the illustration reproductions.

2 Ingrid Rowland and Thomas Howe, eds., *Vitruvius: Ten Books on Architecture* (Cambridge: Cambridge University Press, 1999). A related publication by Thomas Gordon Smith (New York: Monacelli Press, forthcoming) will also include visual depictions.

3 See Philippe Fleury, introduction to Vitruve, *De L'Architecture*, Livre I (Paris: Collection des Universités de France, Les Belles Lettres, 1990) for particulars on the location of the sketches. See also Pierre Gros, "Les illustrations du *De Architectura* de Vitruve. Histoire d'un malentendu," in *Les littératures techniques dans l'Antiquité romaine. Statut, public et destination, tradition*, ed. Claude Nicolet (Genève: Vandœvres, 1996); and Edmond Frézouls, "Vitruve et le dessin d'architecture," in *Le dessin d'architecture dans les sociétés antiques. Actes du colloque de Strasbourg, 26-28 janvier, 1984* (Strasbourg: Université des sciences humaines de Strasbourg, 1985).

4 Aristotle's *Meteorologica*, as with many of the scientific treatises of antiquity, contained a series of illustrations. For a full discussion of illustrations in Aristotle and other scientific treatises, see Pierre Louis, introduction to *Météorologica* (Paris: Collection des Universités de France, Les Belles Lettres, 1982).

5 See Lothar Haselberger, "The Construction Plans of the Temple of Apollo at Didyma," *Scientific American* 253 (1985): 126-132, where the sketches etched upon the temple's surfaces are outlined. Vitruvius writes about the use of drawing instruments in Book I (I, 1.4).

6 See Book I (I, 1.4) where the required expertise is outlined. R. A. Tybout shows that Vitruvius was familiar with two-point perspective drawing. See his "Die Perspektive bei Vitruv: Zwei Überlieferungen von scaenographia," in *Munus Non Ingratum. Proceedings of the International Symposium on Vitruvius' "De Architectura" and the Hellenistic and Republican Architecture*, ed. H. Geertman and J. J. De Jong (Leiden: Babesch Bulletin Antieke Beschaving, 1989), 55-68.

7 In the introduction to his translation of Book I (see note 3), Phillipe Fleury suggests that one of the illustration references (the final one in Book X) may not have been intended as a drawing; to the modern scholar, it is possible that the passage designated a reference to the previous drawing — that of Archimedes' screw — and not to a unique sketch. That the two final references point to the same diagram, however, is difficult to accept and there is no proof to Fleury's allusion. Others maintain it as a separate diagram; see Frank Granger, trans., *Vitruvius De Architectura* (Cambridge: Harvard University Press, 1934, 1983); and Morris Hicky Morgan, trans., *Vitruvius The Ten Books on Architecture* (New York: Dover, 1914, 1960).

8 The diagram for the circle of the winds is the most certain representation provided in the original treatise as the text itself refers to specific points on the illustration.

9 Much of the material that Vitruvius chose to complement with sketches was paraphrased from Greek sources. It is quite possible that his translation into latin would have been simplified with visual inclusions.

10 Quoted material from the *De Architectura libri decem* is from Granger, *Vitruvius*.

11 For discussions of the problem, see Ian Campbell, "*Scamilli Impares*: A Problem in Vitruvius," *Papers of the British School at Rome* 48 (1980): 17-22; and D. Mertens, "Die Herstellung der Kurvatur am Tempel in Segesta," *Römische Mitteilungen* 81 (1974): 107.

12 It is not certain if the stylobate was actually "curved"; the device may have been illusional.

13 For a thorough discussion on the Ionic volute, see Maria Losito, "La ricostruzione della voluta ionica vitruviana nei trattati del rinascimento," *Mélanges de l'École française de Rome, Italie et Méditerranée* 105, no.1 (1993): 133-175.

14 For a discussion of the *chorobates* of Vitruvius, see Jean-Pierre Adam, *La Construction Romaine. Matériaux et Techniques* (Paris: Picard, 1989).

15 See note 7.

16 See Maurice Halbwachs, *The Collective Memory* (New York: Harper Colophon Books, 1980), 78-84. In this paper I use "collective memory" to designate both the passed-down knowledge of the architect and the knowledge derived from the latter's *vécu*.

17 Vitruvius aims the treatise at a wide readership. He dedicates it to Augustus (I, preface, 1) and writes it "with assured authority, not only to persons engaged in building but also to the learned world" (I, 1. 18).

18 By the time Vitruvius completes his treatise — in the vicinity of 25 B.C. — Augustus's building campaign is well underway.

19 For a discussion on Vitruvius's critique of his contemporary architecture, see the still relevant Axel Boëthius, "Vitruvius and the Roman Architecture of his Age," in *DRAGMA - Martino P. Nilsson, ANNO MCMXXXIX Dedicatum* (Lund: Håkan Ohlssons Boktryckeri, 1939), 114-143.

20 Cicero had by then written about rhetoric and related memory devices. For a detailed account of the memory techniques of the Greeks and Romans, see Frances Yates, *The Art of Memory* (London: Routledge and Kegan Paul, 1966).

21 Marc-Antoine Laugier, for example, in his *Essai sur l'architecture* (Paris, 1753) felt that from the "primitive hut" all elements of architecture were developed. For a thorough discussion, see Joseph Rykwert, *On Adam's House in Paradise. The Idea of the Primitive Hut in Architectural History* (Cambridge: MIT, 1981).

22 For a discussion on the debate on the merits of the *First House* discourse, see Mark Cousins, "First House," *Arch Text* 1 (1992-93): 35-38. Others turn to the "First House" in introducing their own theoretics; see R. D. Dripps, *The First House: Myth, Paradigm, and the Task of Architecture* (Cambridge: MIT, 1997). He may be over-extrapolating from Vitruvius's short passage (II, I. 1-2-3), when he uses the tale of the first dwelling to develop a "theory" of the cultural meaning of architecture.

23 Italics in translation text.

24 See Pliny, *Naturalis Historiae*, 36, 47; and Strabo, *The Geography*, XIV, 2.16-17.

25 See for example Jean-François Bommelaer, "Sur les rapports de Vitruve avec la science de son temps: questions de topographie et de géographie," in Geertman and De Jong, *Munus Non Ingratum*, 24-25. Bommelaer shows that the view from the building — it has been excavated by Charles Newton, among others — could not have afforded the lines of sight that Vitruvius delineated.

26 For a review of the cube and body as mnemonics, see Claudio Sgarbi, "Rileggere Vitruvio," *Spazio e Societa* 14, no. 55 (1991): 68-75.