Translation and / or Representation Joseph Rykwert

In the era of the paperless office, which the computer has introduced, the place of drawing in the creation of buildings seems to me to require renewed and close attention. Because drawing is not merely an expressive but also a cognitive activity.

Which puts me in mind of the English sculptor Eric Gill's quoting a child who made some very nice drawings; when asked why they were so good, the child said: "First I think and then I draw my think." Gill opposed that response to the art student's approach: "First I look and then I draw my look."¹

I see the opposition as factitious, since what you think would never have got into your thinking if you had not looked first. The *look* and the *think* are tightly interdependent.

But Gill's aphorism has its use if you wish to understand why drawing is an essential process, one that has given its name to a large body of human activity, the "arti del disegno," "les arts du dessein" unfortunately called the "visual arts" in English, thus divorcing the drawing from the intention. The French language did the same in the nineteenth century: the noun *dessin* was derived from the verb *dessiner* to signify a drawing and separated from *dessein*, defined by the dictionary of the Academy as "intention de faire quelque chose, projet, résolution."

It is that intentionality of drawing that I wish to talk about - the intention of the draftsman towards an end other than the drawing: a

painting, a sculpture, a building. Drawing as the statement of intention towards some artefact other than itself is what concerns me here.

Such intention involves a transition from the capture of a thought or a sight by drawing a line or lines "around" it, as it were, so as to transpose it onto the more corporeal business of other techniques - essentially speaking, in a kind of translation.

This may involve, at its simplest, the passage from the sketch or preparatory drawing to the painting, or from the terracotta or plaster *bozzetto* to the fully formed stone or bronze figure, or, more indirectly, from project sketches to models and working drawings to the building proper. We know that each passage from one stage to the next inevitably entails a loss of spontaneity. Yet, for a century and more, that spontaneity, which many critics hold to be the very guarantee of authenticity, has been valued more highly than the monumental or fully accomplished or smoothly finished final work - the higher and grander *res ipsa*.

The passage of the work of art through the different stages from conception to completion is thus analogous to the filtering that the conception incarnate in the sounds and shapes of one language undergoes in its passage to another language. I speak to you in English, my thoughts are made up of English words. Some of you will receive these words directly, while others will require the services of my translator to have them transformed into French ones, and in that transition the English-word thought will suffer an inevitable change, since words of one language will never quite coincide with those of another. You need only think of the half-dozen English versions of the very simple, innocentseeming French sentence: "Longtemps, je me suis couché de bonne heure."

Although such an analogy is invoked for sculpture and painting, architecture is rarely mentioned in this context, even though the passage from sketch project to finished building is considerably more laborious, with all its inevitable forfeitures and contaminations.

At the beginning of the first modern treatise on architecture, Leon Battista Alberti finds it necessary to define the nature of the architectural operation, which - so he wants his readers to understand - is among the highest of all human achievements. His definition is a polemical one. He starts by refuting a commonplace view of the architect: "It is no carpenter [*tignarum fabrum*] that I would have you compare to the greatest exponents of other disciplines: the carpenter is but an instrument in the hands of the architect."²

The commonplace that Alberti has rejected depends, in part at least, on the ambiguous status of the medieval master mason, but also on the misleading homology involving the Latin *tectum*, which means "roof" or "covering" and forms the second part of the word *architect*. It therefore ignores the primary Greek sense of *architekton*, "chief craftsman."³ In the fifteenth century the noun *architectura* was indeed taken to mean "the roof," "roofing" - the topmost covering. The offending commonplace had the authority of Johannes Balbi's *Catholicon*, which may well have been the most popular medieval word-list or dictionary. Its author gave its date as 1286 but the book was often copied and printed over the next 250 years.⁴

Intent on ennobling architecture, Alberti then proceeds to his own emphatic definition: "Him I consider the architect who by sure, admirable reason and method knows both how to devise in his own mind and through his own energy as well as to realize in construction whatever can be most neatly and aptly fitted out to accommodate the noble actions of men - by working it out in terms of the movements of weights as well as of the joining and massing of solid bodies."

Please note that the primary architectural operation is the working of stable reason and admirable orderliness of method, and that it is an operation of the mind, since it is in the mind that the building project is first devised; only then can it be translated through compositional skills (the joining and massing of solid bodies) and the operations of mechanics (the movement of weights) into whatever might (I paraphrase here) most beautifully shelter the noble actions of men.⁵ Obviously, any *direct* translation from a mental operation to the solid fabric is impossible.

In fact, the slighted carpenter can only become the instrument in the architect's hand after the mental construct had been formulated into a sequence of instructions. These may be reduced to simple verbal directions when the project is a simple one and the craftsmen are highly trained and independent. But the normal instruction will be (as it has



Fig. 1 Andrea Palladio: frontispiece, *I qvattro libri dell'architettura* (Venice, 1570), Call no. CAGE NA44. P164 (ID 88-B1843), Collection Centre Canadien d'Architecture / Canadian Centre for Architecture, Montréal



Fig. 2 Jacopo Barozzi da Vignola: frontispiece, *Regola delli cinqve ordini d'architettvra* (Rome, 1562), Call no. CAGE M NA44.V686 (W3245), Collection Centre Canadien d'Architecture / Canadian Centre for Architecture, Montréal

usually been in the past) in the form of a drawing. Like the carpenter, so the stonemason, the bricklayer, the blacksmith, and (even more demanding) the finicky joiner or plasterer had procedures that were routine and which they acquired as a matter of course and as part of their craft.

For example, no precise specification or instruction - certainly no drawing - would have been required before the middle of the nineteenth century to tell a bricklayer to lay his bricks in a Flemish or English bond or improvise his own, or to tell a mason how to make a scribed joint in an ashlar wall. It was only when a departure from such typical procedures was demanded, and when explicit direction might be needed, that some graphic indication became essential.

The passage from the mental conception to the built form therefore involves a double translation: first, from the architect's mind to the graphic - usually his own - presentation, and second, from the drawing to the building, through the collaboration of those craftsmen who, like Alberti's carpenter, would act as his "hands." In their relation to the architect they are therefore more like singers and instrumentalists to a composer and his musical score than like studio assistants working from the master's sketches on the canvas.

The graphic indications need not be drawn materially to scale, but may be pegged onto the site directly, drawn - or, to put it more accurately. stretched - with bits of string. But from very early times, instructions were condensed through scale reduction onto a surface that could be manipulated - some kind of drawing board. The cliché "on the drawing board" recently acquired the sense of "practical and sensible" - in opposition to "theoretical" - almost as if there need be no mental operation before the drawing of the lines, almost as if the mental, the strictly theoretical part, as it were, did not need to precede drawing-board work. And yet when allegorical figures of architecture appeared in the sixteenth century, sometimes as lady-like statues, sometimes as *putti*, they were usually shown handling compasses, set squares, protractors, and rulers (drawing instruments), and not chisels, trowels, and plumblines (the instruments of the builder). On the frontispiece of both Palladio's or Vignola's treatises (figs. 1 and 2), for instance, the title is flanked by two ladies, representing theory and practice, carrying drawing instruments - for theory, a quadrant and a square, and for practice, a

scale and compasses. Clearly, design was also understood as a process that is done "on the board"; it was the immediate outcome of a chain of reasoning. Work on the drawing board was considered the essential passage from thought to materiality.

Moreover, drawing was most commonly done in some orthogonal form: plan, section, elevation, or even projection. This has been the case at least since the time of Gudea, the *Patasi* or bailiff-prince of Lagash in Southern Mesopotamia towards the end of the third millennium BC, who is shown, in a statue now in the Louvre, holding a drawing board on his knees.⁶ This board or table has a plan of a temple building drawn on it, and lying to one side are a scaled ruler and the stylus with which it was drawn. The sculptor of the statue seems to be alluding to an already familiar practice rather than displaying an innovation; presumably the process of scale representation on a drawing board was well established by Gudea's time. Since then, such orthogonal and relatively abstract drawings have been the most common method of representing the project back to the architect himself as well as forward to the builders who have to act as his hands.

Orthogonal representation, not perspective drawing, seems therefore to be the architect's preferred method of visualizing. Even though the rules of perspective construction had been formulated theoretically - also by Alberti in the 1430s - it was only towards the end of the seventeenth century that a few architects began to design through perspective sketches. In the corpus of about a thousand surviving drawings by Andrea Palladio (some of them splendid and elaborate), there is not a single perspective drawing.⁷ There are practically none by Michelangelo. Leonardo's "visions" of his centrally planned churches are orthogonal projections, even if his drawings for a new city are sometimes detailed in perspective; but these are, of course, not "design" drawings but rather theoretical illustrations, presentation images (figs. 3 and 4) - as are the projection drawings that illustrate the books of Filarete and Francesco di Giorgio.⁸

I have appealed to Alberti because he seems to me to have been among the most clear-headed and perceptive individuals ever to have written about such matters: I would even venture to say that he was the most clear-headed of all. Alberti is particularly instructive - even psychologically so - about how the architect conceives a project, and how the passage from the first notion to its representation modifies it, of



Fig. 3 Leonardo da Vinci: sketches of centrally planned churches (Institut de France, Paris, MS. B.N. 2037 3b), from J.P. Richter and I.A. Richter, *The Literary Works of Leonardo da Vinci*, 2nd ed. (London, 1939), vol. II, pl. LXXXV.1-11, Call no. ID 87-B4362, Collection Centre Canadien d'Architecture / Canadian Centre for Architecture, Montréal



Fig. 4 Leonardo da Vinci: plan for a town (Institut de France, Paris, MS. B 16a), from J.P. Richter and I.A. Richter, *The Literary Works of Leonardo da Vinci*, 2nd ed. (London, 1939), vol. II, pl. LXXVII.3, Call no. ID 87-B4362, Collection Centre Canadien d'Architecture / Canadian Centre for Architecture, Montréal

necessity. He confesses that he himself conceived building projects with which he was very pleased, as long as they stayed in the mind. After he drew them, he found errors in the very bits that had particularly pleased him while the project was only a thought, and accurate measuring and scaling of the drawing would - inevitably perhaps - often reveal yet other misconceptions. In the translation from drawing to three-dimensional model, more mistakes, even regarding numbers and dimensions, would sometimes appear.⁹

That three-dimensional model, he considered an essential instrument for the designer, which is why he was so strenuously opposed to prettified or over-realistic ones. He wanted them almost immaterial - instruments for the full working out of the conception. Of course, the completed version, the final step, is the translation from representation (from any form the model might take, mental-noetic or scaled and physically present) to the thing proper, to the architectural object in its full materiality - something that cannot be accomplished by its deviser or inventor alone, but requires the collaboration of craftsmen with him and with each other.

One of Alberti's most erudite successors, Vincenzo Scamozzi, being a rather dogmatic Aristotelian, had to put all the varieties of both form and material into categories. Inevitably he asserted that forms were excellent in themselves, while materials - which are confused and shapeless by their very nature - can only aspire to potential excellence.

For all that, he warns the architect (whose job it is, after all, to give form to brute matter) against doing any violence to these humbler elements and Alberti would not, I suspect, have found his warning ill-advised: "It is no matter for praise if an architect designs as if he were doing violence to material; as if he were bending the things nature made to his own command, to give them the shape he has willed."¹⁰

Yet Alberti would have formulated this question rather differently, interested though he was in the nature of materials and methods of construction. It was not a matter of categorical distinction for him, but rather a problem of translating one kind of operation into another. For Alberti the whole tangible and phenomenal part of building did not belong to the realm of invention and beauty, but to that of realization, of *sensibilia*, and therefore of ornament. It was not, for him, a matter of imposing one category on another, but rather of giving the notional a perceptible body, of enfleshing or incarnating - of absorbing the tangible and visible stuff into a mental model, or of adding the quality of perceptibility to the inherent beauty of the mental construct.

Still, even the passage from concept to graphics, from graphics to scale model, cannot ever be literal. Like many good translations, it may, at every stage, reveal unsuspected inconsistencies and blemishes in the original.

However, since the project has to be reformulated in the translation from two to three dimensions, the author at that stage can correct his errors, or purge the blemishes on his original scheme. Alfred Tennyson, it is said, would never correct a poem on his own manuscript, but would have it set in type by a local printer at Freshwater on the Isle of Wight - not for publication, but to be able to work on it as if it were not his own, to provide a kind of alienation from the text that the printed proof or later the typewriter afforded, and which the computer has now robbed us of.

The support and help of such graphic translation, on which many writers have depended, has now been withdrawn. It has also eroded the limits over which we need to pass from the mental image to the graphic representation, and this affects all the further stages in correction that Alberti mentioned.

To return to architecture, however: once the craftsman begins to execute the project from the model - usually wooden and homogeneous - and the concept has to be worked out in masonry and carpentry and through the hands of several craftsmen belonging to different trades and working in very different materials, the process of translation from the representation to the *ipsa res* will involve another set of corrections and pentimenti, which may sometimes be much more far-reaching than those of a painter or sculptor.

You may follow the process in some glamorous examples: imagine Michelangelo being commissioned by Pope Clement VII to paint the two "facades" of the Sistine chapel (the two opposite end walls, only one of which was executed - the term *facciata* is used by Condivi as well as by Vasari for the altar wall). The first conversation about the commission probably took place near Florence in 1533, yet both the pope and the painter would surely have stationed themselves mentally in the Sistine



Fig. 5 Michelangelo: study for a fresco on the altar wall of the Sistine Chapel, ca. 1534 (British Museum, London), from A.E. Brinckmann, *Michelangelo Zeichnungen* (Munich, 1925), pl. 64, Call no. W9429, Collection Centre Canadien d'Architecture / Canadian Centre for Architecture, Montréal



Fig. 6 Unknown photographer: interior of the Sistine Chapel, facing Michelangelo's Last Judgement, from the album *Walks In Rome*, vol. II, 1887, albumen silver print, 9.4 x 15.2 cm, PH1980:1104.02:036, Collection Centre Canadian d'Architecture / Canadian Centre for Architecture, Montréal

Chapel - the pope presumably thinking of the wall as it then was, and the painter stripping it mentally of the works by Perugino and Fra Angelico that were already there (and perhaps of his own lunettes as well).

Michelangelo must have thrown a projection - a slide, as it were - from his mind through his eye onto the rough plaster. We know a good deal about Michelangelo's problematic return to Rome soon after, and the preparations of the real wall, and Sebastiano del Piombo's interfering suggestion that the vast painting should be done in oils (a kind of work, Michelangelo thought, fit only for women and loungers like Sebastiano), and Michelangelo's return to fresco. He could then have had no doubt - as we also know, but in retrospect - that between this image first formed in Florence and the accomplished thing there would be many months of selfdoubt, and a working out of the composition in all its details, and that there would follow the years on the scaffolding, during which, with his assistants, he would painfully translate that original, primitive projection into cartoons to be brushed on the vast and very material, empty but expectant surface.

The Sistine *Last Judgment* has had many enemies: prurient and overbearing ones, like Pietro Aretino or Galileo Galilei, or marginally more theological ones, like Paul IV and the Fathers of the Council of Trent;¹¹ but it was also intensely admired from the beginning, frequently copied and engraved. And, in the opinion of many, it had no equal in the history of Western art.

Any painter, however humble, beginning work on a plaster surface or on canvas, will have had some such intuition as Michelangelo must have had in Florence, without which the placing of a first line on a surface is impossible. Some will arrive at that moment by working through many different detailed preliminaries, while others may have the notion ready in the mind before they begin on any drawing. Long before he undertook the *Last Judgment*, Michelangelo had spent several painful years painting the vault of the Sistine Chapel; he would have known, from that first moment of Pope Clement's commission, which of the existing paintings on and around the wall, including some by himself, would have to be removed to make way for his vision. He had long been meditating on the figure of the resurrected Christ, to which there are allusions in some of the preparatory drawings done just after the pope approached him (fig. 5). Between the first commissioning of the fresco, by Clement VII, in 1533



Fig. 7 Chappuis, engraver, after Baldassare Perruzzi: projection drawing showing Bramante's project for St. Peter's, from P.M. Letarouilly, *Le Vatican et la basilique de Saint-Pierre de Rome* (Paris, 1882), vol. 1, pl. 7, Call no. M4867, Collection Centre Canadien d'Architecture / Canadian Centre for Architecture, Montréal



Fig. 8 Michelangelo Buonarroti: exterior, model of half the drum and dome of St. Peter's, 1558-1561 with later modifications (Vatican, Fabbrica di S. Pietro), from L. Beltrami, *La Cupola Vaticana* (Vatican, 1929), pl. 8, Call no. NA5620.S9 B37 (ID 85-B7952), Collection Centre Canadian d'Architecture / Canadian Centre for Architecture, Montréal



Fig. 9 Michelangelo Buonarroti: interior, model of half the drum and dome of St. Peter's, 1558-1561 with later modifications (Vatican, Fabbrica di S. Pietro), from L. Beltrami, *La Cupola Vaticana* (Vatican, 1929), pl. 11, Call no. NA5620.S9 B37 (ID 85-B7952), Collection Centre Canadian d'Architecture / Canadian Centre for Architecture, Montréal

and its completion, under Paul III, eight years later, the original vision of the Resurrection had become the *Last Judgment* that we know (fig. 6).¹²

But I return from that sublime achievement to my primary problem of building, and here again I can appeal to Michelangelo: Would he have had an analogous vision when contemplating the heroic vaults of Bramante's unfinished St. Peter's, which he was to reshape and transform so that they could carry the dome he designed (fig. 7)? The story of that remodelling and of the dome is central to the history of Western architecture and has often been told.¹³

What interests me in this context, however, is that Michelangelo's prime move was to reject *all* the projects that had been proposed or even partly built between his being commissioned and Bramante's first scheme fifty years earlier. He decided to return the church - which the architects in charge of the structure between himself and Bramante had cramped into a Latin-cross shape with a long nave - to a centralized, Greek-cross plan.

Early on in his involvement, two models of the dome were made. He seems to have made the first one, of terracotta, himself, though it has long since disappeared. Following that, he had carpenters make a larger one, 15 feet high - a composite limewood model that survives, though it was modified after Michelangelo's death, first by his successor as the architect to the fabric, Giacomo della Porta, and again, nearly two hundred years later, in the 1740s, by Luigi Vanvitelli, who was then responsible for repairs to the cracking structure (figs. 8 and 9).¹⁴

Michelangelo's own initial notion thus went through a double plastic transformation: from the kneaded and hand-shaped one to the builtup version. He had dismissed the project of his immediate predecessor, Antonio da Sangallo, with undisguised contempt.

A huge model had been made of it, about 25 feet long and 15 feet high, with the intention that it serve as the definitive statement, the perfect contractual working document of the project; Vasari considered it Sangallo's masterpiece (figs. 10 and 11).¹⁵ But Michelangelo took his rejection so far that he actually mutilated the Sangallan model, adapting parts of the interior to try out his own proposals. This kind of working back, manipulating the representation in the interest of another, different conception, is no longer a form of translation, since it involves

distorting the translation to correct the faults of the original text. That is where my analogy between the linguistic translation and the built one may no longer be helpful.

Analogies have limited use, in any case, and should not be forced. I have already suggested one limit when I mentioned Alberti's notion that the conceptual project is in a different sphere from the materiality of construction, which belongs with other *sensibilia* such as the climate or the quality of the soil and water and where the building stands, or even the name of the site. Yet until that last category shift, the analogy of translation has been as useful in considering Alberti's description of the design process as it had been for the work of the architects in earlier times, and as it would also be for many of his successors, who may not have been as clear-headed as he.

However, in the course of the last century and a half something more radical happened to the process, as first the building site and later the techniques of drawing and representation were increasingly industrialized and mechanized; here again translation provides a close and useful analogy.

Perhaps the easiest way to disentangle this particular strand from the many developments with which it is enmeshed may be in a discussion of the professionalizing of design. It is not so much the teaching of it or "qualifications" that concerns me, but the role of the model and the drawing.

About models, Alberti had taught an austere doctrine, as I suggested earlier: they are not for showing to the client as a dinky baby-building all tarted up with colours and model trees - that would be mere display of what Alberti termed ornament. On the contrary, they are to be the architect's own way of working through his project, his method of translating the mental notion or even the two-dimensional graphic account of it into the solidity proper to building.¹⁶

With the industrializing of the building site, a new factor - and another stage - appears in the process of translation: the working drawing is no longer the architect's instruction to the builder, but becomes a binding, legal document in a three-way contract between patron and contractor, contractor and architect.



Fig. 10 Chappuis, engraver: main elevation of Antonio da Sangallo's model for St. Peter's, from P.M. Letarouilly, *Le Vatican et la basilique de Saint-Pierre de Rome* (Paris, 1882), vol. 1, pl. 18, Call no. M4867, Collection Centre Canadien d'Architecture / Canadian Centre for Architecture, Montréal



Fig. 11 Huguet ainé, engraver: elevation and section of the dome of Antonio da Sangallo's model for St. Peter's, from P.M. Letarouilly, *Le Vatican et la basilique de Saint-Pierre de Rome* (Paris, 1882), vol. 1, pl. 20, Call no. M4867, Collection Centre Canadien d'Architecture / Canadian Centre for Architecture, Montréal

This is not to say, of course, that patrons and builders were not litigious in the past: Hammurabi's code, compiled in Babylon some three centuries after the time of Gudea of Lagash (whose statue I mentioned earlier), imposed very heavy penalties for building failure - including the death penalty for a builder if his patron was killed when a house collapsed.¹⁷ The Greeks exhibited building contracts and specifications, engraved on stone tablets, beside the buildings to which they referred; Vitruvius counted the law as one of the essential disciplines of the architect.

In my generation the building process has been locked in a tight mesh of contract and regulation that is a product of an investment economy controlled by corporate patronage, of different production and assembly methods, and of a much more highly organized - because much more capital intensive - building technology.

This has thrown more weight on the drawing: the three-dimensional model is now a relatively insignificant aspect of the process of representation. It would seem that the mechanization of the drawing process in the computer, which is very recent - just over twenty years old - will become another factor in smoothing that process.

What is increasingly obvious, however, is that the passage from the graphic representation to the three-dimensional scale model can now be made by a relatively simple mechanical operation on the screen;¹⁸ and a wood, or plastic, or even stone model can be plotted or cut directly from computer software.¹⁹ And because of the very ease with which computer representations, both two- and three-dimensional, can be altered in this way, they will no longer be regarded as reliable "documents."

This problem has already arisen acutely in the financial world, where online registration or transmittal of information are not considered binding. Of course, "hard" copy may still be required for documentation, and the contractual importance of drawings and models will - perhaps, paradoxically enough, because of the very ease of computer operation - give increasing weight to the graphic quality of the drawings and the communicative power and precision of tangible and three-dimensional models.

I surmise that the quality and value of a translation from one language to another depends much more on the translator's mastery of the language into which he is translating, on his judgment and skill, and less on his knowledge of the language of the original text. That is why the mirage of a literary computer-aided translation has receded out of reach. It will be no different, if my analogy holds, for building. The idea of a project entirely computer-generated from a set of specifications seems an even more tenuous mirage to me; and the idea of conceptless designing seems logically excluded, in view of what I said earlier.

There is no escape from the translative cycle of concept-representationrealization. At each stage of that cycle, choice and judgment, as well as mechanical skill, have to be exercised. Therefore, if my paradox holds, it almost seems as if the mechanization and now the digitization of the means has focused attention on elaboration and precision, the very quality of representations.

NOTES

- [1] Eric Gill, Autobiography (London: Jonathan Cape, 1940), 162.
- [2] "Non enim tignarum adducam fabrum, quem tu summis caeterum disciplinarum viris compares: fabri enim manus architecto pro instrumento est. Architectum ego hunc fore constituam, qui certa admirabilique ratione et via tum mente animoque diffinire tum et opere absolvere didicerit, quaecunque ex ponderum motu corporumque compactione et coagmentatione dignissimis hominum usibus belissime commondentur." Leon Battista Alberti, *De Re Aedificatoria*, "Prologus," with Italian translation in *L'architettura*, ed. P. Portoghesi and G. Orlandi (Milan: Il Polifilo, 1966), vol. 1, 7ff.; English translation in *On the Art of Building in Ten Books*, tr. J. Rykwert, N. Leach, and R. Tavernor (Cambridge, Mass.: MIT Press, 1988), 7 (slightly modified). This echoes Cicero's *De Claris Oratoribus*, 73, "Ego me Phidiam esse mallem, quam vel optimum fabrum tignarum."
- [3] The Latin tectum is related to the Greek *steg, which relates to covering. Hence the architector is one who concerns himself with "top covering" as Du Cange has it, faber qui facit tecta. The modern use of the term is a transliteration of architekton, the chief craftsman or maker, the master builder; tekton is from the Greek tekein, the Indo-European root being *tek, making, begetting.
- [4] See Joseph Rykwert, "On the Oral Transmission of Architectural Theory," *RES: Anthropology and Aesthetics* 5 (1983), 25ff. *Tignarum fabrum* literally means joist-maker, but is a common term for building-carpenter.
- [5] See note 2.
- [6] That particular diorite statue of Gudea of Lagash is headless, but there are several other statues of him in the Louvre with the head intact.

- [7] For example, see Palladio's sheet with drawings of the Temple of Romulus and the Temple of Vesta (Royal Institute of British Architects, London, inv. SC213/VIII/1 recto), published in H. Burns with L. Fairbairn and B. Boucher, *Andrea Palladio 1508-1580: The Portico and the Farmyard* (London: Arts Council of Britain, 1975), 103, no. 194, and his elevation for the Palazzo Ducale project (Chatsworth, Devonshire), published in *Andrea Palladio e Venezia*, ed. L. Puppi (Florence: Sansoni, 1982), cover and pl. 31.
- [8] One of the fascinating exceptions is the rather elaborate drawing of Donato Bramante's Tempietto at San Pietro in Montorio (a central-perspective drawing of the circular building), which has had various attributions, including inevitably one to Bramante himself. It is now ascribed to the late sixteenth-century painter Federico Barocci. Among Michelangelo's drawings, the study for the Laurentian Library staircase (Casa Buonarotti, Florence, 92a) has some central vanishing-point sketches of the arrangements of the ramps. But clearly, such drawings are quite exceptional and contrast with the vast mass of orthogonal drawings and of details, some of them elaborately drawn and shaded.
- [9] Alberti, *De Re Aedificatoria*, IX.10, in Portoghesi and Orlandi, xx, and in Rykwert, Leach, and Tavernor, 317.
- [10] "Non é molto lodevol cosa che l'architetto tenti di far come violenza alla materia: in modo che egli pensi di ridur sempre a voler suo le cose create dalla Natura . . ." Vincenzo Scamozzi, L'idea della architettura universale, vol. 2 (Venice, 1615), 173ff. Like Palladio and Vignola, Scamozzi has two ladies flanking his frontispiece, whom he called *Theorica* and *Experientia*, but he also includes a number of other figures.
- [11] See Romeo De Maio, Michelangelo e la Controriforma (Rome and Bari: Laterza, 1978), 17ff., 31ff., 253ff.; D. Redig de Campos, Il giudizio universale di Michelangelo (Fermo: Andrea Livi, 1964), 64ff.
- [12] A number of early drawings exist, such as Casa Buonarotti, Florence, 65ff. Slightly later ones are in the Museum at Bayonne and in Windsor (12776). Michelangelo, however much he valued the instant *concetto*, had no respect for overly rapid execution, as is clear from his remarks recounted by Francisco de Hollanda. But see David Summers, *Michelangelo and the Language of Art* (Princeton: Princeton University Press, 1981), 64ff.
- [13] For bibliography see Christoph Luitpold Frommel, "St. Peter's: The Early History," in The Renaissance from Brunelleschi to Michelangelo: The Representation of Architecture, ed. Henry A. Millon and Vittorio Magnago Lampugnani (Milan: Bompiani, 1994), 399ff.; Henry A. Millon and Craig Hugh Smythe, Michelangelo Architect: The Facade of San Lorenzo and the Drum and Dome of St. Peter's (Milan: Olivetti, 1988), 93ff.; and James S. Ackerman, The Architecture of Michelangelo (Chicago: University of Chicago Press, 1986), 193ff., 317ff.
- [14] See Millon and Lampugnani, The Renaissance from Brunelleschi to Michelangelo, 44-45, 663-665, no. 396.
- [15] For photographs of Sangallo's model, see Millon and Lampugnani, *The Renaissance from Brunelleschi to Michelangelo*, 35, 41, 632, no. 346.

- [16] Alberti, De Re Aedificatoria, bk. 2, sec. 1; Portoghesi and Orlandi, vol. 1, 97ff., and in Rykwert, Leach, and Tavernor, 33ff. Of course, such a model will also allow him to judge of many ornamental matters, such as quantities of materials and even costs.
- [17] J. Bottéro, Mésopotamie: L'écriture, la raison et les dieux (Paris: Gallimard, 1987), 191;
 G.R. Driver and John C. Miles, eds., The Babylonian Laws (Oxford: Clarendon Press, 1952), vol. 1, 425ff.
- [18] A good survey of contemporary drawing techniques is provided by Jean-Paul Saint-Aubin in *Le relevé et la représentation de l'architecture* (Paris: L'Inventaire, 1992).
- [19] On the process of cutting such models directly from software see Felice Ragazzo,
 "I modelli lignei delle opere di Leon Battista Alberti alla mostra di Palazzo Te," in *Leon Battista Alberti*, ed. Joseph Rykwert and Anne Engel (Milan: Electa, 1994).