Introduction: The Conventions and Rhetoric of Architectural Drawing

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By a convention of architectural drawing, I mean the sign—made normally on a two-dimensional surface—that translates into graphic form an aspect (e.g., the plan or elevation) of an architectural design or of a building. It is an arbitrary invention, but once established it works only when it means the same thing to an observer as it does to the maker; it is a tool of communication.

Drawing is not the only means for communicating architectural form. For centuries designs and buildings have been represented in models or verbally, communicating different aspects. Now they may be composed by computer-aided design (CAD), which is becoming progressively more flexible and responsive.

The first consideration is for the instruments and materials of drawing: surfaces, tools, equipment, media. Paper, to start with: its introduction into the West in the fourteenth century opened up the possibility of recording rapid impressions, of sketching, for the first time. Parchment, used previously, was in general too expensive for any but definitive images, and not suited to sketching, to experimentation. Few parchment drawings survive; the cost and sturdiness of the material encouraged scraping off drawings to make the surface available for new drawings or texts.

Sheets of paper are not neutral with respect to the drawings done on them; they are generally cut in a rectangular format that promotes a certain range of orientation in the drawing—in particular, the lining up of straight orthogonal lines parallel to the paper's edges. The format of paper was echoed in that of the drawing board, which permitted the

introduction of the T-square and triangle. Almost all drawing boards and a high proportion of drawings have a horizontal dimension greater than the vertical. Is this attributable to the nature of the body, bringing the top of the sheet nearer to the draftsman and conforming to the favored action of the arm? Are most drawings horizontal to conform with the lateral extension of the majority of buildings? What about the orientation of plans?

In perspective drawings, the rectangular sheet of paper is an analog of the window through which an object is seen; there is an inevitable conformity between the technique of perspective projection described by Leon Battista Alberti in 1435, not long after the introduction of paper, and the format of the sheet.

The drawing is affected also by the color, texture, size, and density of the support. The introduction of trace paper in the eighteenth century not only facilitated the development of project ideas by eliminating painstaking transferals from one opaque surface to another (as by pricking the outlines with a needle), but facilitated interactions among plan, section, and elevation. An effort to codify the ways in which transparency influences the design process would only rigidify its open potentialities; it is sufficient to indicate its importance.

Drawing instruments obviously affect not only the appearance of the drawing but the character of the building they are used to represent. The quill pen, often used to ink in lines incised with a metal point, dominated the earliest drawings, and was joined around 1500 by a finely sharpened black chalk, a material similar to the modern Conte crayon. Michelangelo favored the much softer red chalk because it suited his more sculptural and textural orientation. Shortly after 1600, Borromini pioneered the use of graphite—essentially the modern pencil—which could be sharpened to a very fine point and at the

same time could communicate a wide range of texture and shadow. From the Renaissance on, ink washes were employed as an enrichment of line drawing, to distinguish mass from void in plans, and to emphasize contrasts of light and shadow in elevations, sections, and perspectives. Increasingly, from the eighteenth century on, watercolor was adopted where pictorial effects were sought. Later innovations simply refined these choices, as with the substitution of the steel pen for the quill. The computer constitutes the only significant modern addition to the repertory.

Once an architectural convention is established, it maintains an astonishing consistency through time. Plans and elevations were common in Roman antiquity; almost all those we know represent existing or ideal buildings, but the working elevation of the Pantheon pediment has been found recently, incised on the pavement of the Mausoleum of Augustus—at full scale.

THE PLAN

Plans are arbitrary diagrams of a nonexistent footprint. Buildings are not simply set down on flat surfaces like a model on a table. The fragment from the marble plan of ancient Rome (Fig. 1.1) is even more arbitrary than most; being just lines and dots, it is the diagram of a diagram.

But plans, apart from the fact that they indicate something literally invisible, are highly capricious. The representation in Fig. 1.2 of the Erechtheon in Athens vividly illustrates the arbitrariness of the convention. The building has three quite different levels that are all represented as if they were on the same plane. Even structures on rela-

Figure 1.1: Fragment from the Marble Plan of Rome.

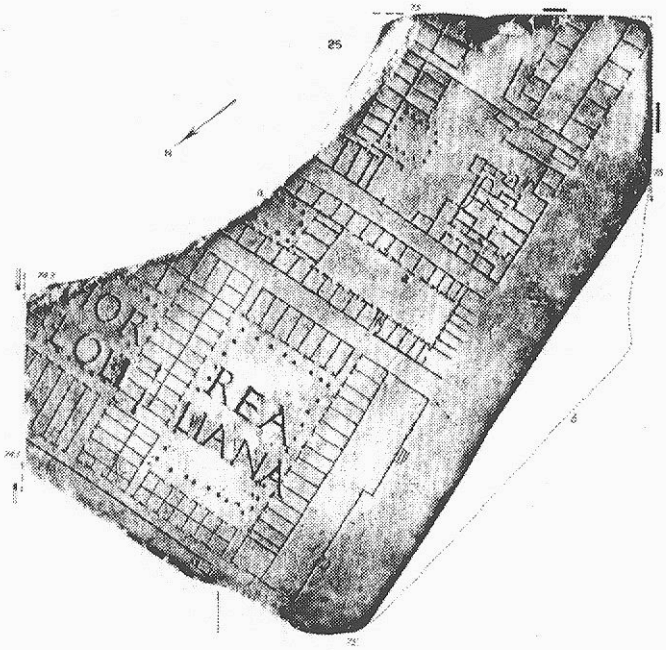
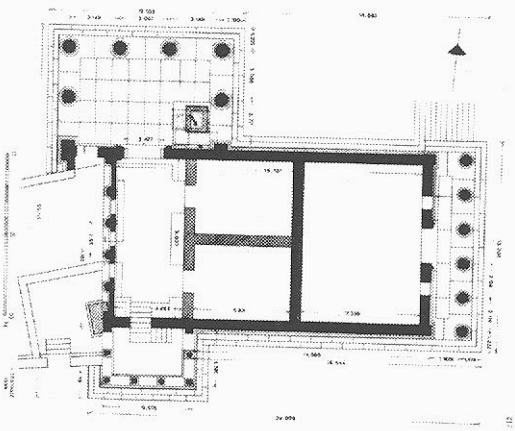


Figure 1.2: Athens, Erechtheon. Plan.



tively flat bases are composites of different horizontal cuts, one at the base of the steps, one at the base of the columns, one at the bottom of the column shafts. The thirteenth-century plans from the lodge book of Villard d'Honnecourt (Fig. 1.3) is an early example of combining the footprint type of plan with what is called the "reflected" plan of the vaulting overhead. Moreover, the vaulting is represented as if it were on a flat surface, though actually it curves up toward an apex.

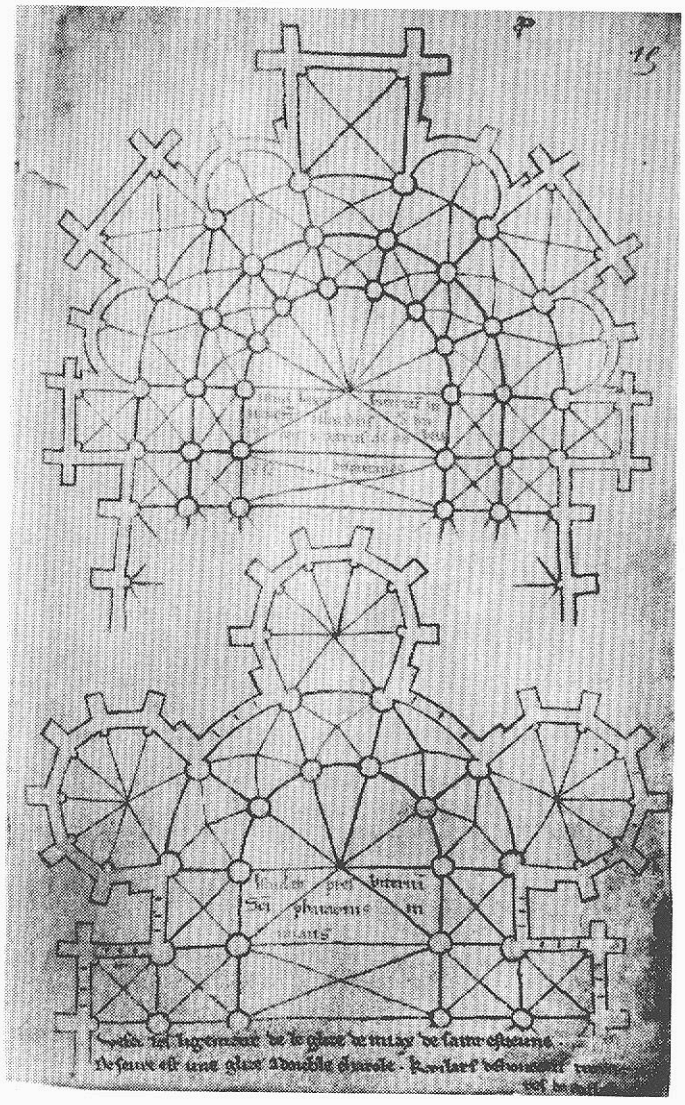


Figure 1.3: Villard de Honnecourt, Project (with Pierre de Corbie) for a Chevet and plan of S. Étienne, Meaux. Paris, Bibliothèque National, ms. Fr. 29093.

The section remained basically the same since its first appearance in the thirteenth century; that attributed to Peter Parler for the fourteenth-century Prague Cathedral (Fig. 1.4) is the earliest fully correct one I know, though the innovation is probably traceable to the Reims workshop in the 1220s. As with the plan, the section's cut through the walls is unverifiable by eye; in most cases, it can be drawn only with the aid of the plan. From the start, parts of the building at some distance behind the vertical section were represented—in this case, the flying buttresses.

Some nonrectilinear designs of our own time make it difficult to make and to read a section either because the structure is not rectilinear or has constant shifts of planes (Fig. 1.5).

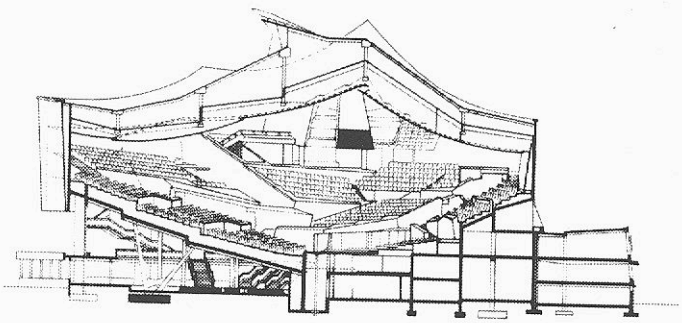


Figure 1.5: Berlin, Philharmonic Hall (Hans Scharoun). Longitudinal section. From Eckehard Janofske, *Architektur-Räume: Idee end Gestalt bei Hans Scharoun* (Braunschweig/ Wiesbaden, 1984).

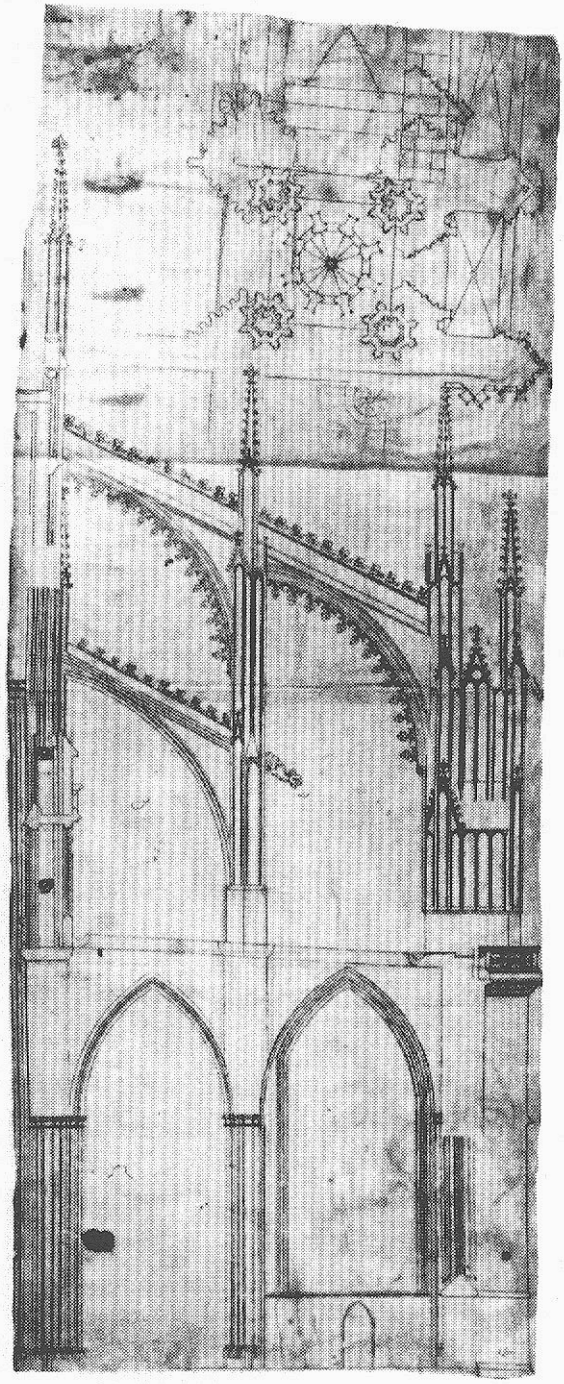


Figure 1.4: Shop of Peter Parler, Prague Cathedral, partial section of choir. Vienna, Akademie der bildenden Künste, Kupferstichkabinett no. 16821.

THE PERSPECTIVE

The Roman theorist Vitruvius, whose text on architecture was the only one to have survived into the Renaissance, recommended perspective drawings—rather ambiguously—and they have been employed since the fifteenth century to help designers to visualize their work in three dimensions or to make finished renderings for patrons, who understandably are almost always baffled by the abstractions of the conventions we have just examined, and to represent and reconstruct existing buildings.

The major Renaissance theorists opposed the use of perspective as a means of architectural representation because the receding lines would inevitably be unmeasurable and therefore misleading. In practice, all the architects made perspectives anyhow. But in the very period in which geometrically constructed central-point perspective had been invented and most exploited, architects paradoxically preferred to use ad hoc approaches to representing buildings in three dimensions. They thus avoided the rigidity of the fixed central eye-point, and made it possible to put the observer in whatever horizontal or vertical position most favored their purpose.

A few sixteenth-century architects, notably Baldassarre Peruzzi, employed geometrically constructed perspective in some drawings (Fig. 1.6); it may have been his interest in the design of illusionistic stage sets that led him to a truly sophisticated control of projection, in which the plane of projection is behind the surface of the paper.

Wolfgang Jung has proposed recently that among Peruzzi's early sixteenth-century contemporaries Bramante and Raphael, perspective techniques were employed not only to represent architecture but, at the initiation of a design, to compose. Because

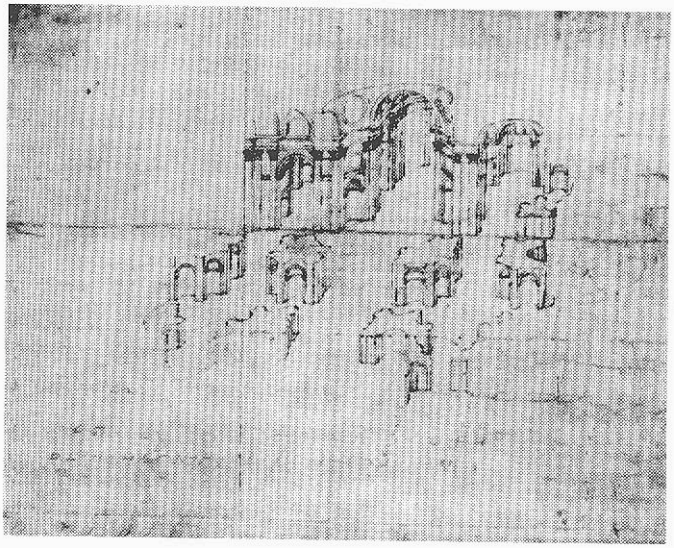


Figure 1.6: Baldasarre Peruzzi, Project Drawing for the Basilica of St. Peter, Vatican. Florence, Uffizi, 2Ar.

Renaissance perspective construction served also to establish a system of proportions, the designer could use the technique to achieve both visual coherence and a rationalized proportion system.

A drawing by Mies van der Rohe illustrates how perspectives, unlike plans, elevations, and sections, lend themselves especially to rhetorical exposition (Fig. 8.2). By rhetorical I mean that the aim is not simply to re-present as faithfully as possible an architectural space or mass, but to present it to the viewer so as to emphasize the particular goal of the design; in short, to persuade. Mies's interior perspective for the Barcelona Pavilion is meant to emphasize the perspective effects, the reflectivity of the marble surfaces, and the role of the planes of wall, ceiling, and floor. The columnar support is rendered virtually transparent.

The perspective section aims to give a readable impression of a building's interior; it is used to represent round or polygonal interiors, or parts such as cupolas (if the interior

is rectilinear, it can be shown as an elevation, and perspective is not relevant). Philibert de Lorme in 1568 showed a cut through the Chapel at Anet (Fig. 1.7) in which we see, in an ad hoc perspective impression, the inside and outside simultaneously, and the thickness of the wall as well. The drawing would be useless as a guide to a builder or mason. The Renaissance opponents of perspective in the presentation of architectural designs—notably Alberti, Raphael, Palladio, and Barbaro—appealed for orthogonal elevations built up from the plan, so that all measurements would be to scale so that they could be transferred directly to the building. This is particularly critical in drawing the orthogonal elevation or section of a circular or polygonal structure, as represented by another sixteenth-century drawing (Fig. 1.8), by Antonio da Sangallo the Younger, with

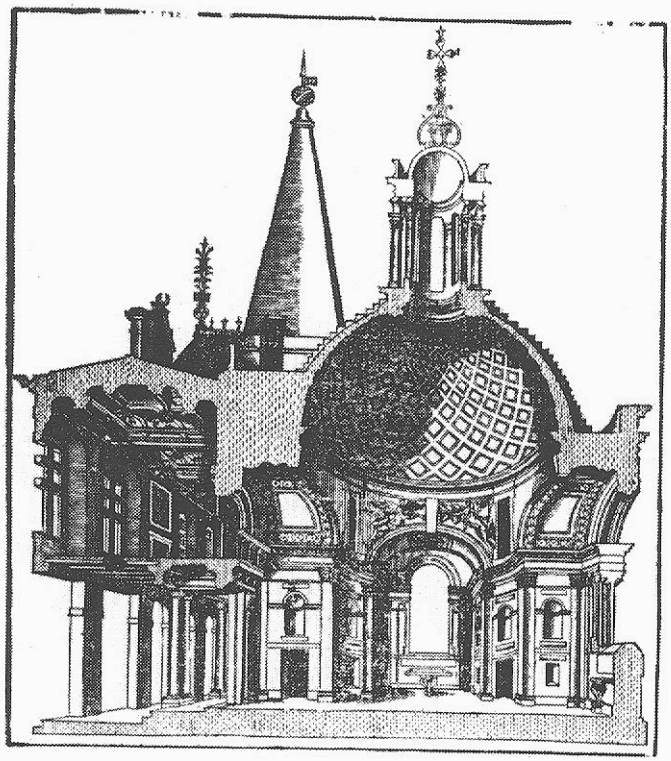


Figure 1.7: Philibert Delorme, Perspective/Section of Chapel at Anet. From *Première tome de l'architecture* (Paris, 1567).

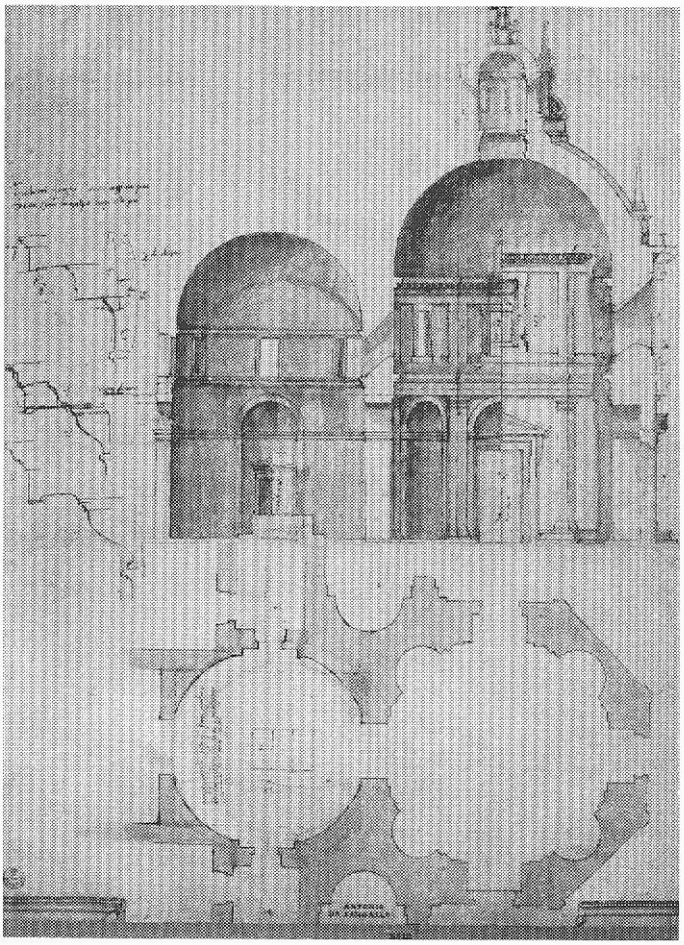


Figure 1.8: Antonio da Sangallo the Younger, Church of Monte Moro presso Montefiascone, Project for Plan, Elevation and Section. Florence, Uffizi, Arch. 173.

the plan, section and partial elevation (to the right of the central line of the larger rotonda) of a church of roughly the same scale as that at Anet. The plan would have been drawn first at the bottom of the sheet, sot that position of all the elements of the elevation and section could be placed with a T-square held at the bottom of the drawing board.

In the seventeenth century, military engineers developed the technique of axonometric drawing, which permitted representations of constructions in three dimensions in

Figure 1.9: William Farrish, Machine. From "On Isometrical Perspective," Transactions of the Cambridge Philosophical Society, I (1822).

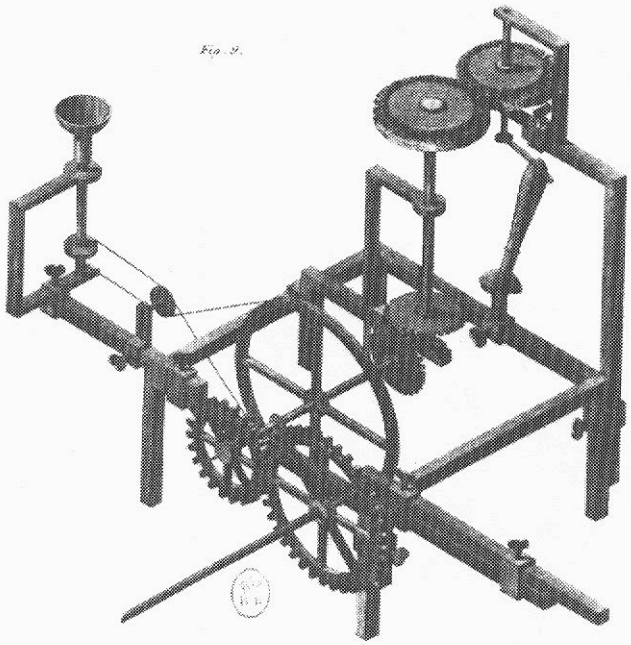
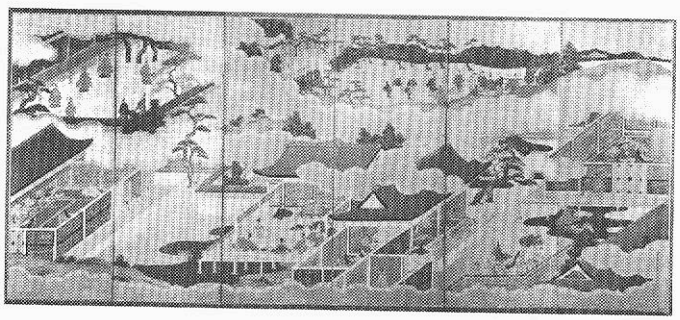


Figure 1.10: Tale of Genji, Japanese Screen 17th century. Boston, Isabella Stewart Gardner Museum.



which correct measurements could be retained in the receding planes (Fig. 1.9). A non-geometrical, subjective form of axonometric had existed even before the Renaissance; Japanese painters of the fourteenth century (Fig. 1.10) frequently illustrated dwellings and town settings from an elevated viewpoint, but without perspective diminution, as a way of facilitating their narratives—again for rhetorical purposes. In the Renaissance, a

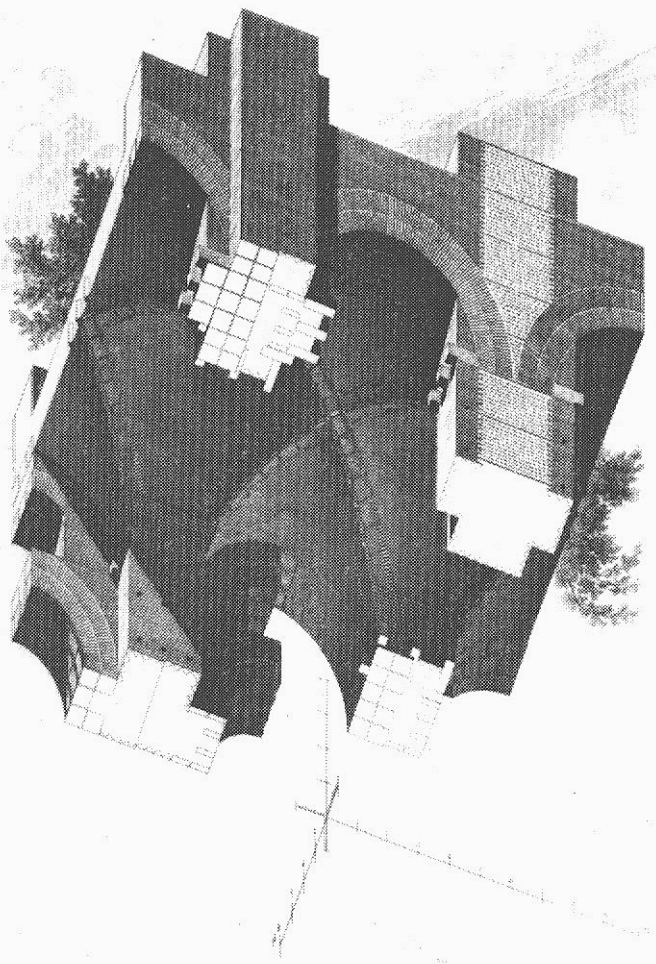
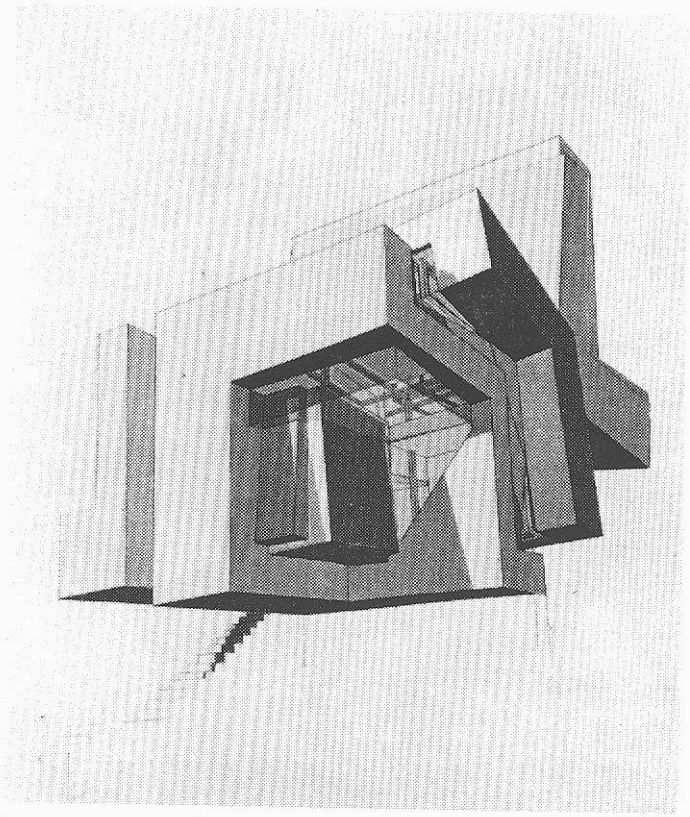


Figure 1.11: Auguste Choisy, Roman Vault. From *L'art de bâtir chez les romains*, Paris, 1883.

similar, unconstructed approach—in that it is not geometrically constructed—was found to be the most effective way of representing complex machines, but in such cases the receding lines were normally shifted around to whatever angle would reveal the most about a particular part of the structure.

The axonometric method proved to be particularly suited to the forms of twentieth-century architecture, with its favoring of straight lines and flat planes. But it came into

Figure 1.12: Peter Eisenman, Drawing for Guardiola House, Puerto de Santa Maria, Cadiz, Spain.



prominence through widely used texts on the history of ancient and medieval architecture by Auguste Choisy, of the 1870s and 1880s. Fig. 1.11 shows how, in addition to its other advantages, it can show the plan as well as the interior and exterior.

Painters of the early twentieth century also exploited the axonometric, adding to the basic graphic method the spatial potentialities of color. El Lissitsky, a Russian artist who worked in Germany, produced many exhibition designs, which he claimed to be his most important work. Figures 7.5–7.8 were drawn for an exhibit at Hanover in 1926–27. Like many of his contemporaries, he held pseudoscientific theories of designing expanded space and time into his work. Parts of the drawing can be read as a projection from

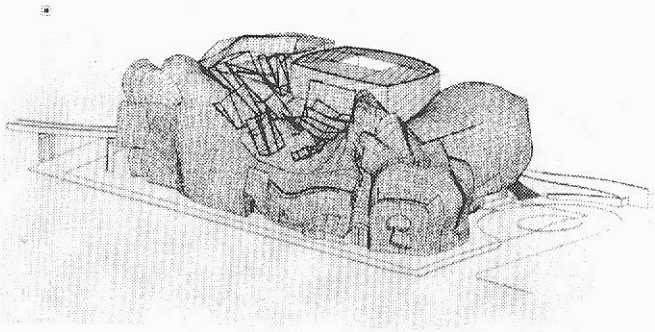
either below or above, and the figure is calculated to confuse the dual reading: the shifts are intended to actualize the viewer's experience in time and space. In a series of house studies (Fig. 1.12), Peter Eisenman has employed axonometric projections of increasing complexity not only to reveal the interpenetration of planes, but to explore the complexity and incoherence of spatial relations.

Mies van der Rohe developed a unique form of architectural representation in which the structure itself could be represented as a void (Fig. 8.6). Space is constructed by rectangular planes collaged onto the surface, which suggest depth by their differing dimensions and ground planes, and by the character of the collaged images. Although they reject perspective representation, these drawings in fact call upon the viewer's understanding of perspective to visualize a readable space out of the void. Historically, they are allied to the minimalism of the 1960s in painting and sculpture.

CAD: The Computer Image

Computer-aided design is having a profound effect on architectural drawing (Figs. 9b.3, 9b.4). As a technological innovation in the field, its importance equals that of the introduction of paper. It is almost indispensable in supporting the technical aspects of working drawings such as lighting, heating, acoustics, ducting, and structural detailing. It moves easily between two- and three-dimensional imaging, allowing for visualization of forms and spaces previously worked out. Increasingly, it has the capacity of hand-made drawing to depart from the predetermined parameters programmed into the software. Recently a new application—most widely disseminated in illustrations of the work of

Figure 1.13: Frank Gehry, Study for Guggenheim Museum, Bilbao.



Frank Gehry, and utilized by him in the Guggenheim Museum in Bilbao—has permitted a great expansion of capability in devising complex manipulation of planes in undulations and curves (extensions of what Robin Evans, in describing the difficulties in correctly calculating by traditional means the covering of Le Corbusier's chapel at Ronchamp called "ruled lines") beyond the capabilities of traditional stereotomy (in any case, virtually a lost technique) (Fig. 1.13). Here the machine does not merely accelerate drawing processes that previously had been carried out only by hand, but opens up a potential not attainable on the drawing board, one with extraordinary opportunities for the extension of architectural form. The architect's freehand approximative sketches and even rough cardboard models, of whatever curvilinear complexity, can be converted by the computer into precisely measurable elements and then directly feed into the production of the constituent units. While the software available heretofore proved rather to limit the freedom and spontaneous invention that, at best, characterizes the interplay of tool, hand and imagination, the potential exists for radical changes in the nature of architectural design—for example, the abandonment of symmetry, even in low-cost construction, or a return to structural stone masonry.

As a sign, the convention refers to an aspect that is signified. If the drawing in which it is used represents an existing building or a finished project, then it relates to the signified somewhat as a verbal description relates to an aspect of the object it refers to. This is not to say that either the graphic or verbal description "accurately" represents the signified, but only that it relates to it in some way that can be read. What are the different effects of a graphic and written representation? What aspects of architecture are more communicable by drawing as opposed to words?

A study by Michelangelo for the plan of the church of San Giovanni de' Fiorentini in Rome, of 1559 (Fig. 3.6), poses the question of what the graphic sign signifies in the case of a sketch or study for a possible structure that has not fully materialized in the designer's mind. Is it then a sign for a mental image? That would be a possible explanation in terms of Cartesian psychology, which, I take it, would hold that the mental image is fixed and uninflected by the process of drawing. But architectural sketching is most often an interactive process in which an initial idea is put down and the mark suggests an extension of that idea, which then results in an altered mark, and the interchange goes on until a resolution is found; such sheets are particularly precious because they bring us closest to the moment of conception. An earlier proposal for the same building by another architect, Antonio da Sangallo the Younger (Fig. 1.14), presents alternative proposals in a more readable way, yet one (a longitudinal plan with side chapels) is quite inconsistent with the other (a circular plan with radiating chapels).

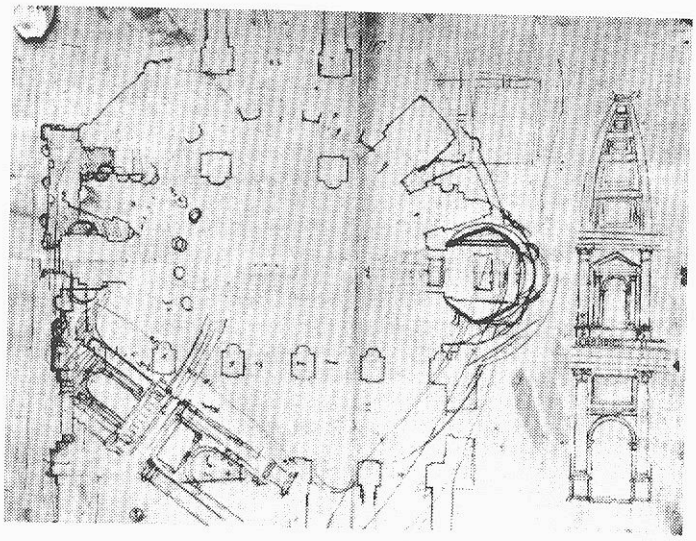


Figure 1.14: Antonio da Sangallo the Younger, Sketch Sheet for San Giovani dei Fiorentini, Rome.

Even marks aimlessly made can be organized by a draftsman into purposeful form. Leonardo da Vinci proposed that a painted composition be started from a stain made by throwing a sponge against a wall. Can we then say that invention is thus physical as well as mental, or is the very distinction basically invalid?

Consider the ways in which the architect's sketch in preparation for a work may differ from the painter's or sculptor's. A basic convention of the former, such as a plan, bears virtually no visual relationship to the structure as built; one cannot even see the plan of a completed building. Yet most frequently, the initial studies for a building are made in plan. The figural artist, on the other hand, makes preparatory sketches that relate directly to the appearance of the intended sculpture or painting—sometimes for the composition as a whole, sometimes for some part of it; he or she has virtually no conventional signs that are stand-ins for the final product.

The Representation of Existing Buildings

The rhetoric of drawing is perhaps best illustrated in representations of buildings that already exist (Figs. 1.16, 1.17). The existing building has an autonomous physical presence, potentially visible not only to the draftsman but to everyone else. We could presumably check the "accuracy" of a depiction against the original. But there are many potential "accuracies." The draftsman selects the building with a particular purpose in mind, and that purpose affects what is represented and how. An immense range of representations is available, from the surveyor's or archeologist's orthogonal elevation to the watercolorist's building set in a landscape and rendered with its contours and details blurred by contrasts of light and shadow and of color. The surface and the instruments used are chosen in accordance with the purpose and the intended affect; in the first example, it may be a delicate line executed on drafting paper with a fine steel pen, or engraved on a metal plate; in the second, it may be loose brushwork applied to a variety of rougher surfaces. Not only does each representation seek to convey a particular message with the means best adapted to it, but each observation is the product of an individual's way of perceiving, and of his way of conveying what he perceives. The latter involves individual traits of rendering, comparable to handwriting, and the style of the time and place of making.

Louis Kahn sketched the Hypostyle Hall at Karnak in a wholly idiosyncratic way (Fig. 1.15), as a moment in his career-long pursuit of the effects of light and of monumental composition. Even photographs of the same building are inflected by the same personal and cultural forces that affect drawings.

Figure 1.15: Louis Kahn, Hypostyle Hall, Karnak. Collection Sue Ann Kahn.

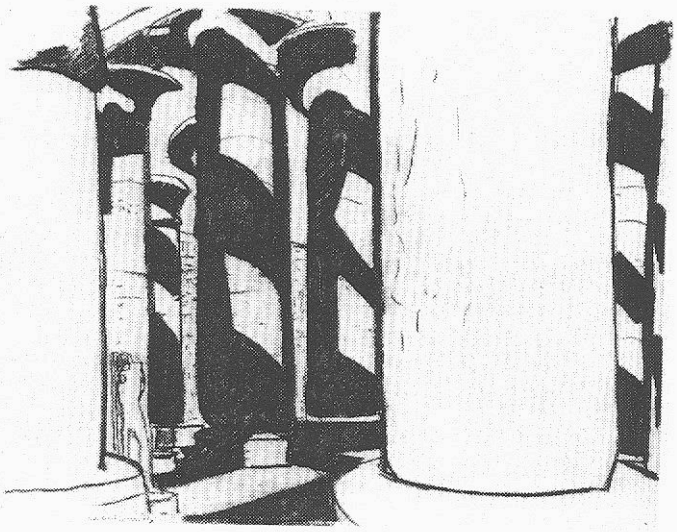
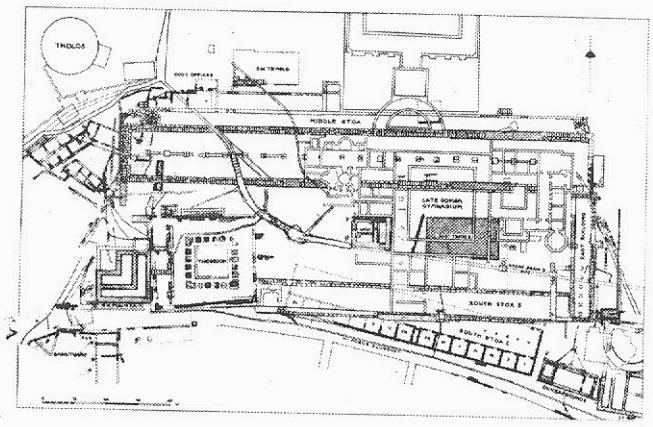


Figure 1.17: Athens, Agora. Plan. (From *Hesperia*, 1968).



Piranesi's etching of the base of Castel St. Angelo in Rome (Fig. 1.16) is an exercise in communicating the sublime; its intention is not to provide clues to the appearance of the building, but to overwhelm the viewer with what the artist saw as its awesome power.

The representation of the results of modern archeological excavation are certainly the drawings least influenced by personal factors. We call them "objective" when the aspects the draftsman depicts correspond to our expectation of how the drawing can be

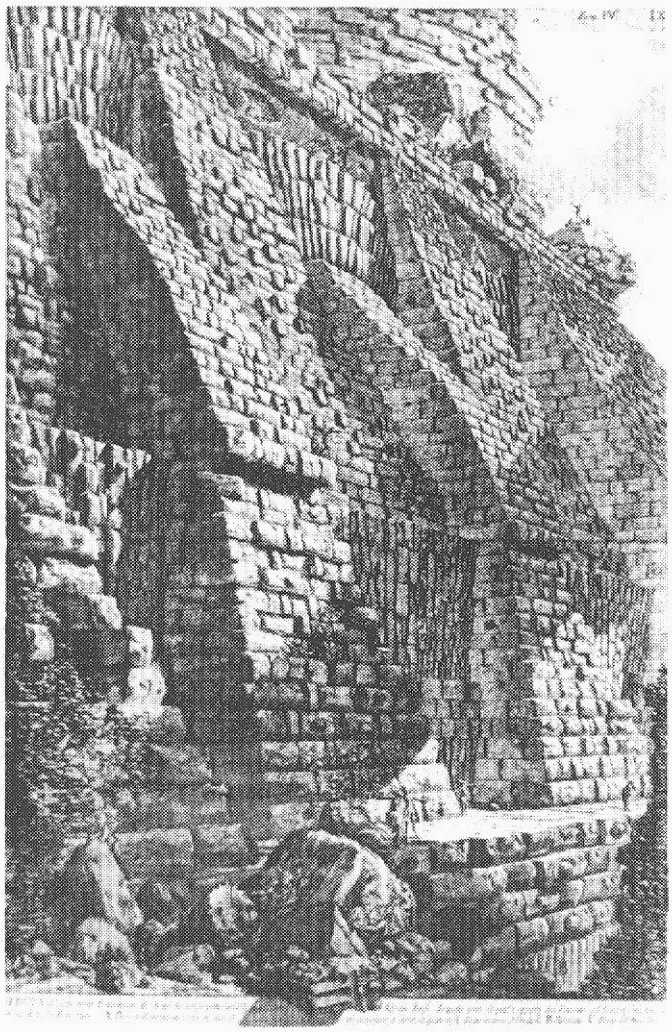


Figure 1.16: Giovanni Battista Piranesi, Moat of Castel San Angelo, Rome. From *Antichità romane IV*, 9 (Rome, ca. 1775).

most useful. In the plan of the Agora at Athens (Fig. 1.17), we can follow a story of the palimpsest of culture in the course of time. But we could go with this drawing in hand to the site it describes and be totally unable to orient ourselves. The structures shown here are mental constructs hypothesized from scraps of evidence, much of which may have been destroyed in the finding.

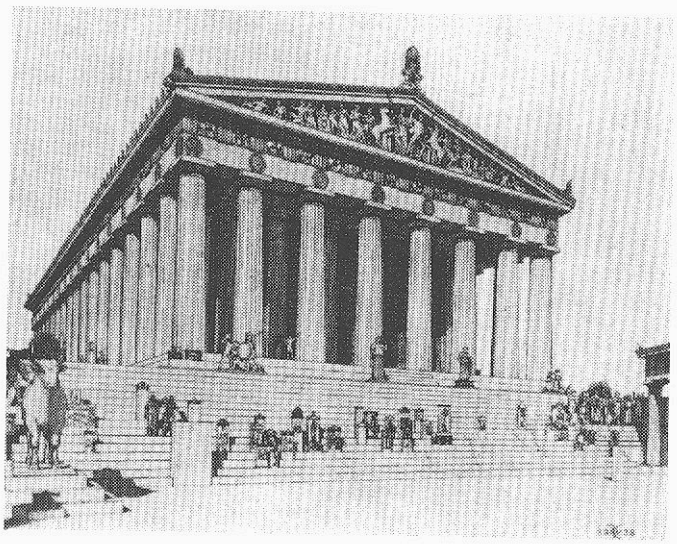


Figure 1.18: G.P. Stevens, Reconstruction of the Parthenon, Athens. From *Restorations of Classical Buildings.*

The reconstruction of destroyed or altered buildings tends to edge closer to Piranesi's fantasy than to the measured plans. All are redolent of the historical moment in which they were made. A typical reconstruction of the Parthenon in Athens (Fig. 1.18) selects a viewpoint calculated to dramatize the approach in a mid-twentieth-century way, seeking verisimilitude by the addition of actors in Greek costume. Another visitor to the Parthenon, before it had been blown up in the early fifteenth century, provided a quite different restoration (Fig. 1.19). There also is a built-in unreliability in the presentation of the elevations and sections of existing buildings; there are no rules constraining the draftsman; he may have arrived at the height of an entablature or the width of a wall by guessing. Guessing is the preferred method in representing the heights of Gothic cathedrals, which have mostly proven to be too tall to be measured by affordable means.

In early (pre-1500) drawings this alteration is usually due to an indifference to what we would call accuracy: Richard Krautheimer showed that medieval draftsmen might

represent any kind of central plan building as round, since the symbolism of centrality was more significant than the actual form.

We know the Renaissance period for its devotion to the remains of antiquity, and for the astonishing number of drawings of ancient remains surviving from the hands of Renaissance architects and renderers. We would expect these drawings to provide as accurate a representation of ancient remains as the techniques and style of the time

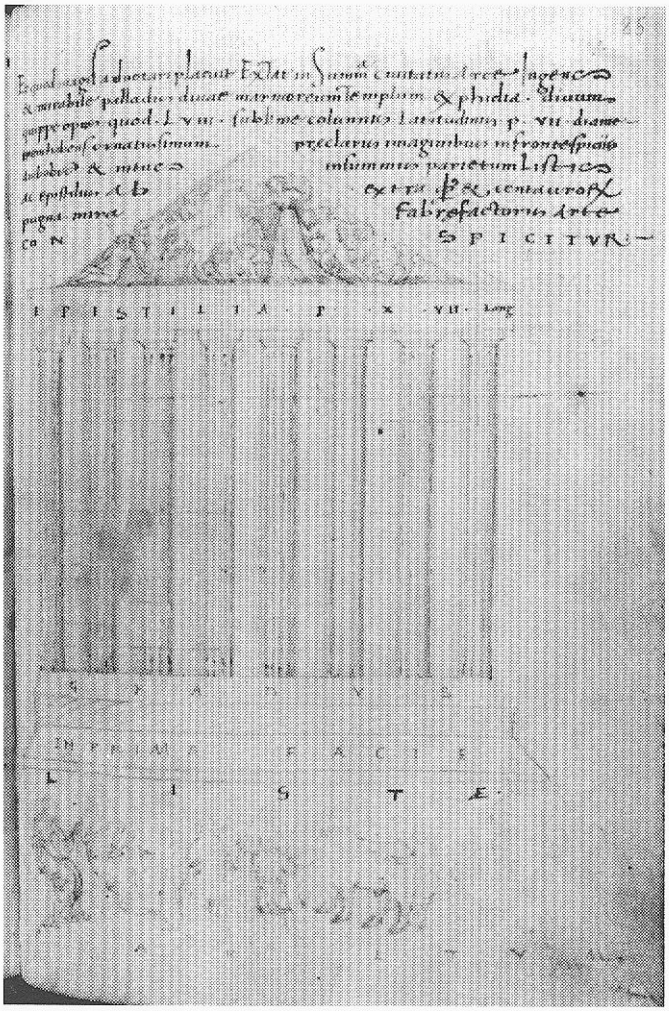


Figure 1.19: Ciriaco d'Ancona (15th century), Façade of the Parthenon. Athens. Fol. 85r, Ms. Hamilton 254, Staatsbibliothek zu Berlin.

would have permitted. Not so; even, or perhaps especially, the most distinguished architects remade antiquity according to their own interests or carelessness. A reconstruction of Santa Costanza in Rome by Francesco di Giorgio Martini (Fig. 1.20)—a structure that still stands in an exceptionally good state of preservation—presents the circular plan with eighteen pairs of columns around its central space, rather than the twelve that actually are there, and ignores the thick walls and niches.

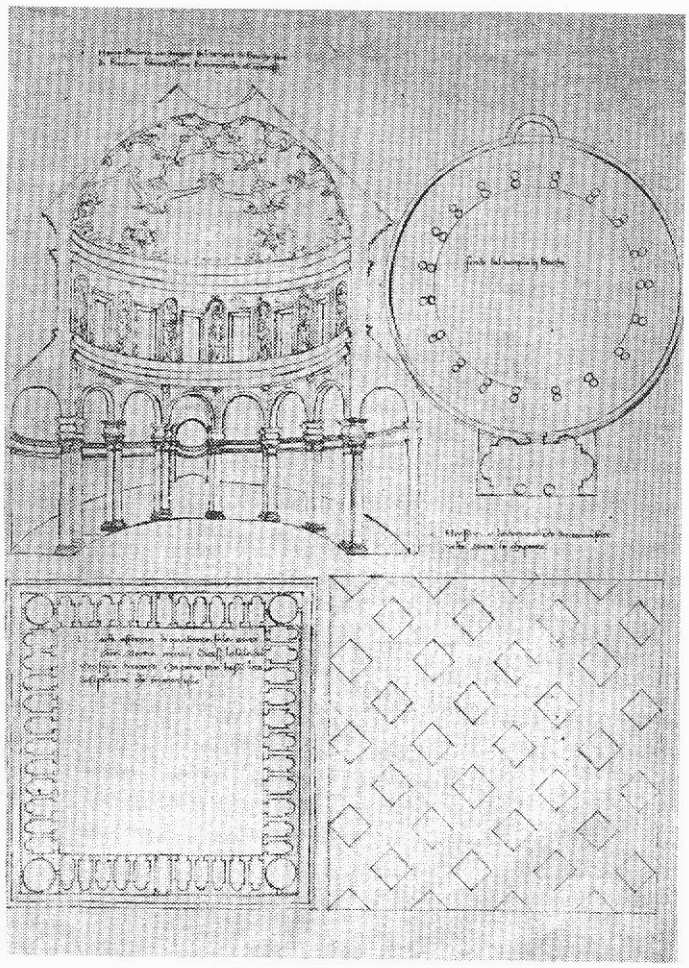


Figure 1.20: Francesco di Giorgio Martini, Plan and Section of Santa Costanza, Rome. Turin, Biblioteca Reale, Ms. Saluzzo 148, c. 88.

Does this mean that the representation of existing buildings is the same sort of signification as the representation in painting and figural or landscape drawing?

Portraits, like architectural representations (other than those intended for use), are normally expected to resemble the subject in some way, and they do observe or occasionally establish conventions current in their time (as early Renaissance portraits adopt the forms of ancient coins, medals, and busts). Like most architectural representations (e.g.,

Figure 1.21: Raffaello Sanzio, Tommaso Inghirami. Boston, Isabella Stewart Gardner Museum.

those of Piranesi), they are substantially recast in the style and technique chosen by the artist and patrons. Portraits typically transmit not only what is observed, but nonvisible aspects of the sitter: character, status, aspirations, etc. Architectural representations are no less colored by social and political forces. The Portrait of Tommaso Inghirami (Fig. 1.21) is easily recognizable as the work of Raphael by virtue of its clear outlines, uniform fields of color, and a subtle mix of idealization and realism. It communicates the status of the sitter, his profession—by means of his dress and the work in which he is engaged—as a humanist and Prefect of the Vatican Library, a notable idiosyncrasy of appearance (a wall-eye), and what appears by his upward glance (by contrast to the more common engagement with the portraitist) a desire to communicate with a higher power, whether his Maker or his muse.

The Rhetoric of Drawing

In sum, the architectural drawing is not just a document containing the required data, but inescapably bears the stamp of the author's personal style and that of the time and place, to the degree that a practiced viewer can identify the draftsman—provided an adequate number of drawings by the same hand have been documented—or at least the approximate date, through evidence that is primarily of a formal character, but can include the maker's orientation toward what is presented. Further, a drawing may be a graphic form of architectural theory, conceived not only to illustrate the designer's principles but to persuade the viewer of their rightness (Fig. 8.6).

An architectural drawing may be not just a means to an end, but an end in itself. Since at least the eighteenth century, architectural drawings have been prized by collectors and exhibited as works of art, and have acquired a value on the art market. They can become an object of fashion quite disconnected from the making of buildings, to the extent of being quite unbuildable (in what sense is the fashion of drawing like that of clothes?) or an advertisement (presentation drawings, competition drawings). Contemporary books and periodical articles on the work of individual architects can become showplaces for drawings intended only for publication and publicity. Many architects, particularly those most widely known, have built reputations on drawings prior to having built much of importance: Le Corbusier, having few commissions in his early career during World War I, energetically produced and published architecture on paper. In recent years, Tschumi, Koolhaas, Eisenman, Coop Himmelblau, and Libeskind have exercised great influence on the profession and on architectural education primarily through drawings.

A drawing may be the intentional misrepresentation of architectural process, being made after the completion of building; Palladio published his own buildings at the end of his career, altering many of them to conform with his changed aims. Sometimes the spontaneous, exploratory drawings in contemporary monographs are dashed off after the completion of a building to add zest to its publication.

But the visual world would be far duller if architects restricted themselves to drawings that are subservient to the process of building, or to the need to represent their designs pictorially for clients and the public. The rhetoric of drawing, even when it falsifies and manipulates, is central to its power and appeal.

Finally, the conventions are, in a sense, elements of a language; like words and sentences, they are invented or arrived at by mutual agreement and, once in place, remain with little change for centuries. Because they are a way in which an architect communicates basic aspects of his work with anyone interested in building and the art of architecture, altering or attempting to improve them can result only in confusion. Therefore, unlike architectural styles or drafting techniques, they have almost no history. Radically new expressions can be realized with established conventions, as they were in the earlier twentieth century. Although it is interesting for a historian to examine the reasons, the ideology, and the conditions of the invention, issues of evolution are of only minor historical interest. This field of investigation, then, is more closely related to semiology than to standard architectural research. It is an alternative to architectural history as it has been practiced, and its appeal lies in the fact that it is pursued not in libraries and archives, but with real works in hand, through visual experiences and the ruminations that follow them.