The Conventions and Rhetoric of Architectural Drawing
By "a convention of architectural drawing" I mean the sign—made normally on a twodimensional surface—that translates into graphic form an aspect (e.g., the plan or elevation) of an architectural design or of an existing 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.

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, though a full-scale project elevation for the pediment of the Pantheon was found recently incised on the pavement of the Mausoleum of Augustus.

My first consideration is for the instruments and materials of drawing. Paper, to start with, when introduced 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 or experiment. Few parchment drawings survive; the cost and sturdiness of the material encouraged scraping away drawings to make the surface available for new drawings or texts (see chapter 2).

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 elevation and perspective drawings have a horizontal dimension greater than the vertical. This must be attributable to the nature of the human body, bringing the top of the sheet nearer to the draftsman and conforming to the favored action of the arm.

On the other hand, plans, particularly those of longitudinal temples and churches, are often vertically oriented, perhaps so that the entrance is nearest to the draftsman. The drawing is affected also by the color, texture, size, and density of the support.

In perspective drawings, the rectangular sheet of paper is an analogue 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 introduction of tracing paper in the eighteenth century not only facilitated the development of project ideas by eliminating painstaking transfers from one opaque surface to another (as by prickling 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 also 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; it 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 was the first to make extensive use of graphite—essentially the mineral encased in the modern pencil. This tool could be sharpened to a very fine point or used in other ways to communicate a wider 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 repertoire.

Drawing has not been the only means for communicating architectural form. For centuries designs and buildings have been represented in models, which have the advantage of vivid representation more accessible than the abstraction of drawings to clients,
The Plan

Plans are arbitrary diagrams of a nonexistent footprint. Real 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. 12.1) 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. 12.2 of the Erechtheion in Athens vividly illustrates the arbitrariness of the convention. The building has three quite different levels that are all represented here as if they were on the same plane. Even structures on relatively flat bases are shown as 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 de Honnecourt (fig. 12.3) are 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.
The Section

The section remained basically the same from its first appearance in the thirteenth century; that of Peter Parler for the fourteenth-century Prague Cathedral (fig. 2.6) 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 sections 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 included in the representation—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 because it has constant shifts of planes (fig. 12.4).

The Perspective

The Roman theorist Vitruvius 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 (figs. 2.16, 2.18). 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. 2.23); it may have been his interest in the design of illusionistic stage sets that led him to a truly sophisticated control of projection, with the plane of projection placed behind the surface of the paper.

A drawing by Le Corbusier illustrates how perspectives, unlike plans, elevations, and sections, lend themselves especially to rhetorical exposition (fig. 12.5). By rhetorical I mean that the aim is not simply to represent 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. Le Corbusier's interior perspective for a villa design is meant to exaggerate the depth of space and the interplay of abstract planes, and to emphasize the revolutionary contrast to middle-class living spaces of the late nineteenth century.
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 Delorme in 1567 showed a cut through the chapel at Anet (fig. 12.6) 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, in which all measurements are exact and can be used in building (fig. 2.20). To make the kind of orthogonal elevation or section of a circular or polygonal structure represented by fig. 2.20, it is practically essential to construct it from the plan, which is why, in the relatively few Renaissance drawings of such buildings that are orthogonal, the section is drawn directly above the plan on the same sheet.

In the seventeenth century, military and mechanical engineers developed the technique of axonometric drawing, which permitted representations of constructions in three dimensions in which correct measurements could be retained in the receding planes (fig. 12.7). A nongeometrical, subjective form of axonometric had existed even before the Renaissance; Japanese painters of the
seventeenth century (Fig. 12.8) 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 similar, unconstructed approach was found to be the most effective way of representing complex machines, but in this case the receding lines were normally bent around to whatever angle would reveal 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 prominence through widely used texts on the history of ancient and medieval architecture by Auguste Choisy, beginning in the 1870s. Figure 12.9 shows the plan as well as the interior and exterior of a Roman vaulted structure.

Painters of the early twentieth century also exploited the axonometric, adding to the basic graphic method the spatial potentialities of color. El Lissitzky, a Russian artist who...
El Lissitzky, project for the Cabinet of Abstraction in the Provincial Museum, Hannover, Sprengel Museum.

Peter Eisenman, drawing for Guardiola House, Puerto de Santa Maria, Cádiz, Spain. (Photo courtesy of the architect.)

Mies van der Rohe developed a unique form of architectural representation in which the structure itself could be represented as a void (Fig. 12.12). Thus the Resor House project is represented by an interior elevation in which the wall, which is glass, is only a picturesque collage of photographs of a vast landscape beyond it (not even the one that would have been seen from the house) and two mullions, of blank paper; the broader white bands are steel columns. Although they reject perspective representation, Mies's drawings of this kind 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.

Computer-aided design is having a profound effect on architectural drawing (Fig. 12.13). As a technological innovation in the field, its importance perhaps equals that of the introduction of paper. It is now almost indispensable in supporting the technical aspects of working drawings, such as those for 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 new applications, facilitated by the software Form Z and Alias—and best known to the public in illustrations of the work of Frank Gehry, especially the Guggenheim Museum in Bilbao (Fig. 12.14)—have permitted a great expansion in the ability to devise complex manipulations of planes in undulations and curves (extensions of what Robin Evans called ruled lines) beyond the capabilities of traditional stereotomy (in any case, now virtually a lost technique). Here the machine does not merely accelerate drawing processes that had previously been carried out only by hand, but opens up a potential not attainable on the drawing board, one with extraordinary potential for the extension of architectural form.
Asymptote (Hani Rashid and Ee Arne Couture), Interface study, Guggenheim Virtual Museum, 1999. Photo courtesy of the architects.

Frank Gehry, study for Guggenheim Museum, Bilbao. Photo courtesy of the architect.
Hand and Mind

As a sign, a 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 the 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 a 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. 12.15), 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. This is how Michelangelo's plan became so heavily worked over; while it may have lost its initial clarity, it gained an expressive vitality that makes every element seem to be alive and in evolution. 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 (fig. 12.16) by another architect, Antonio da Sangallo the Younger, presents alternative proposals in a more readable way, though one (a longitudinal plan with side chapels) is quite inconsistent with the other (a circular plan with radiating chapels).

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. Invention may thus be physical as well as mental, though neuroscientists today are questioning this distinction.
The architect's sketch in preparation for a work differs 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 (figs. 6.17, 6.18).

The Representation of Existing Buildings

The rhetoric of drawing is perhaps best illustrated in representations of buildings that already exist (figs. 12.17-12.22). The draftsman chooses the building he or she wants to draw 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 architect'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 effect; 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 or her way of conveying what he or she perceives. The latter involves individual traits of rendering, comparable to handwriting, and the style of the time and place of making. Therefore the "accuracy" of a depiction is entirely idiosyncratic; there are many potential "accuracies."

Louis Kahn sketched the Hypostyle Hall at Karnak in a wholly idiosyncratic way (fig. 12.17), as a moment in his career-long pursuit of the effects of light and of monumental composition. Photographs of a building are inflected by the same personal and cultural forces that affect drawings (see chapter 4).

Piranesi's etching of the base of Castel Sant'Angelo in Rome (fig. 12.18) 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 representations of the results of modern archaeological 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 most useful. In the plan of the Agora at Athens (fig. 12.19), 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, or covered over after being found.

The reconstruction of destroyed or altered buildings tends to edge closer to Piranesi's fantasy than to the measured plans. All are resolutely of the historical moment in which they were made. A typical reconstruction of the Pantheon in Athens (fig. 12.20) 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 Pantheon, before it had been blown up in the early fifteenth century, provided a quite different restoration (fig. 12.21). 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 or she 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 are mostly too tall to measure 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 an accurate representation of ancient remains as the techniques and style of the time 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 the fourth-century Santa Costanza in Rome by Francesco di Giorgio Martini (fig. 12.22) demonstrates this.
12.22—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.

We might ask whether the representation of existing buildings is the same sort of signification as 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, medallions, and busts). Like most architectural representations, they are substantially recast in the style and technique chosen by the artist and patrons. Portraits typically transmit not only what is observed but aspects of the sitter that can be inferred by symbolic clues: character, status, aspirations, etc. Architectural representations are no less colored by social and political forces, as is clear from the example by Piranesi discussed above (fig. 12.18). A portrait of Daniele Barbaro (fig. 9.1) conveys the sitter’s gravity through his expression and his lack of contact with the painter and viewer; his position is indicated by the vestments of his office (as Patriarch-Elect of Aquileia), and his achievements by the prominent role of his published works. Attention is further directed to his architectural interests by the colossal column and an odd capital-like form alongside it.
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. (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 the validity of his or her point of view (fig. 12.12).

An architectural drawing may be not just a means to an end but an end in itself. Drawings can be the only way of presenting projects that are visionary or at least temporarily unrealizable. They can become promotional instruments (presentation drawings, competition drawings) or an object of fashion quite disconnected from the making of buildings, to the extent of being quite unbuildable (the fashion of drawing resembles that of clothes). In the past century many architects, particularly those most widely known, have built reputations on drawings prior to having built much of importance: Le Corbusier, having had few commissions in his early career, 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 disseminated through books and periodicals, and in art galleries and museums. 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.

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 or her 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.