

2.0
G.B. Nolli,
Map of Rome,
1748, engraved
by G.B. Piranesi,
detail.



Chapter Two

Space and Mass: Figure/Ground Relationships

The basic ingredient of architectural design consists in two elements, mass and space. The essence of design is the interrelation between these two. In our culture the preponderant preoccupation is with mass, and to such an extent that many designers are "space blind."

-EDMUND BACON

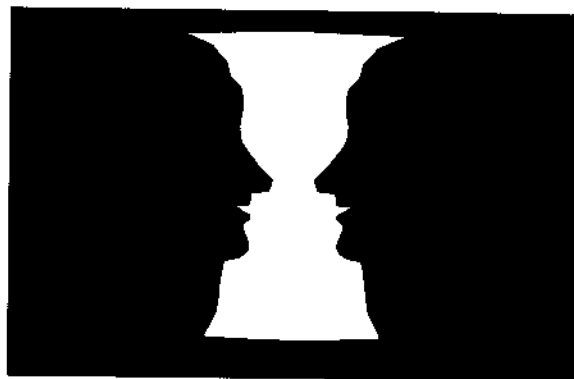
Mass and space are essential components of architecture: one cannot be understood independently of the other. They define one another. Only through the differentiation of mass from space can one perceive objects, discern outlines, and grasp the limits of a void through reference to its boundaries. Space can be figural, capable of organizing forms around it. Space can be extensible, capable of sweeping out a swath to connect distant elements with each other or with the plane of the earth, the sky, or the horizon. While things, even very large things, are in some way limited in their extent, space is by definition boundless.

Indeed, a nineteenth-century theoretician, Alois Riegl, posited that the production of art in different historical epochs was governed by the different sensory organs which were primary in perception. According to Riegl, in the early history of aesthetic production the sense of touch was dominant. **Haptic** artifacts, produced in response to this predilection, were frequently heavy, solid volumes with clearly defined

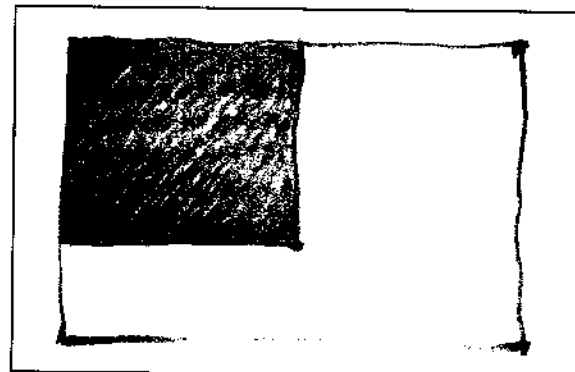
boundaries. The Egyptian pyramids are examples of haptic structures. Such objects can be well represented by small solid models or axonometric drawings since they are closed, isolated, discrete forms. Some time around the Renaissance, a shift occurred which favored the sense of sight as the primary receptor of perception. The emphasis of **optic** architecture moved away from the description of things to the description of spatial relationships between things. Perspective drawing is a good vehicle for investigating such designs: not only the space enframed by the architecture is represented, but the location of the **vantage point** further implies the space between the viewer and the depicted scene.

Optical puzzles which allow an interchangeability of figure and background are familiar from children's books. Proper interpretation of the images depends on whether one reads the dark part as the primary figure and the white part as background, or the reverse. Stare at the white vase in Figure 2.1 and the black area ap-

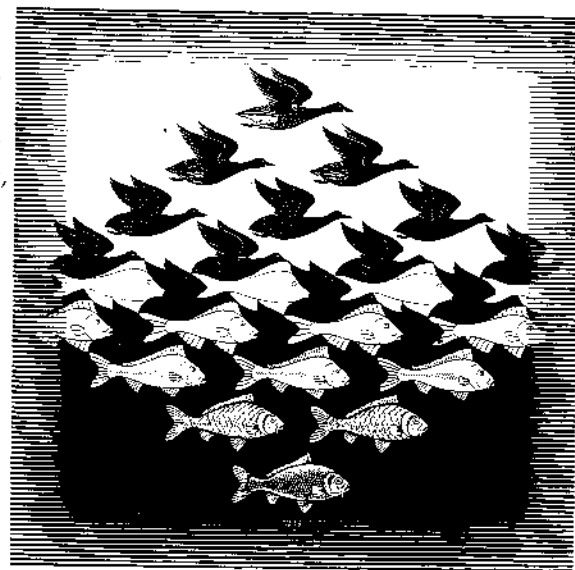
2.1
A vase or two
faces.



2.2
A black
square or a
white ell.



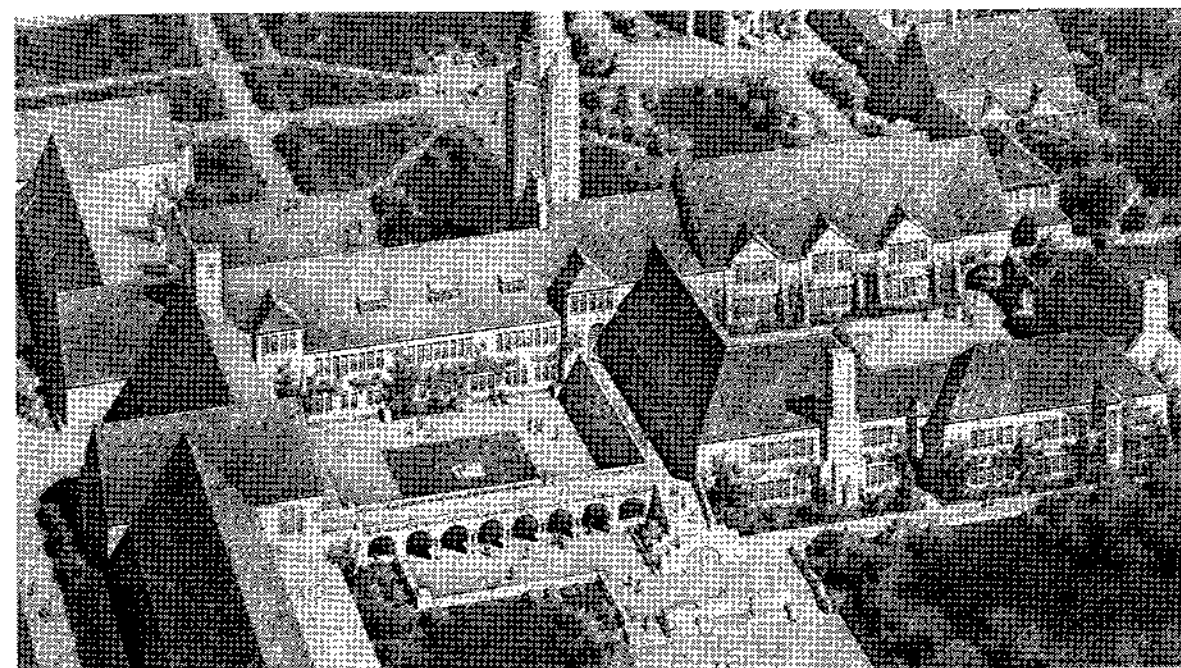
2.3
M.C. Escher, "Sky
and Water I,"
1938, M.C. Escher
Foundation, Baarn,
Holland.



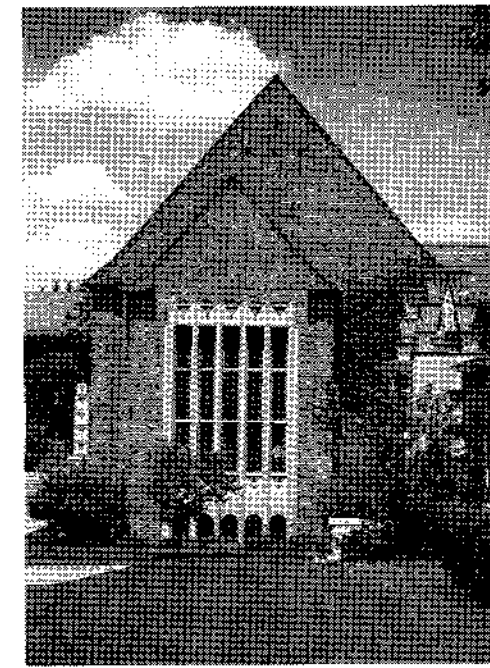
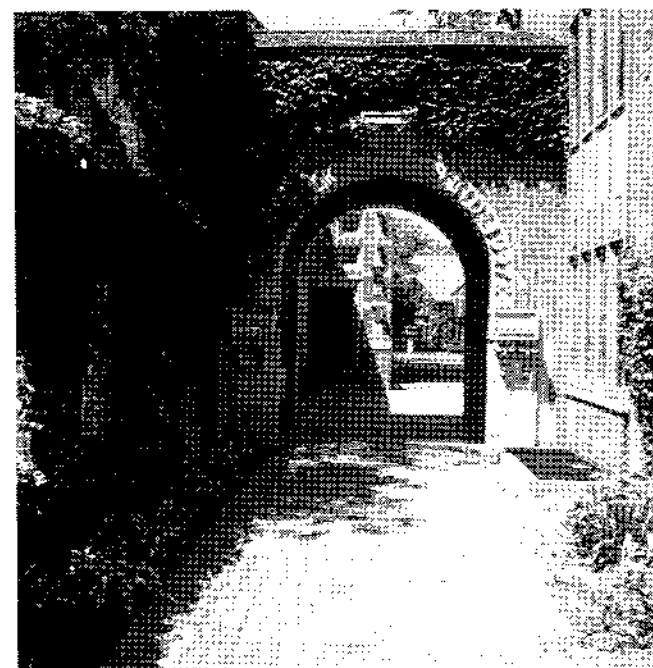
pears only as a plain background. Stare at the black facial profiles at the edges and the white looses its figurality, likewise appearing as a simple background. In the second drawing the image is even simpler, consisting of pure rectangular fields of black and white. What is it? A white ell? A black square? The interlocking of figure and field gives the image its capacity to sustain multiple, reversible readings. In *Sky and Water 1*, M.C. Escher (1898-1972) makes the shifting play between figure and ground thematic in his drawing. Almost indiscernibly fish becomes fowl and foreground exchanges places with background.

We can extend the discussion of these drawings to include architecture. In three-dimensional objects, as in two-dimensional drawings, form makes itself manifest through contrast to a background or a surrounding space. Buildings do not exist as pure entities in abstract, characterless space. Rather, they are situated in elaborate relationships to complex environments. In some instances, buildings function primarily as edges to define a greater collective space. This is the case in **Eliel Saarinen's** (1873-1950) **Cranbrook School** of 1925. While all the buildings at the Cranbrook School are carefully crafted and architecturally distinctive from one another, it is not the individual buildings but the collection of quadrangles, courtyards, pathways and lawns that provides the most memorable image of the campus. The shaping of exterior space is the primary task of the architecture.

In other instances, buildings are perceived as objects in their surroundings, acting as centers, monuments, or landmarks. Here space is much more neutral. The **plasticity**, or three-



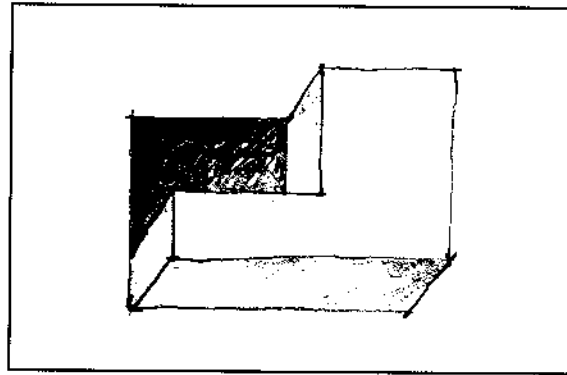
2.4
Eliel Saarinen,
Cranbrook
School,
Bloomfield
Hills,
Michigan, c.
1925.



2.5, 2.6
Left and Right:
Eliel Saarinen,
Cranbrook
School.

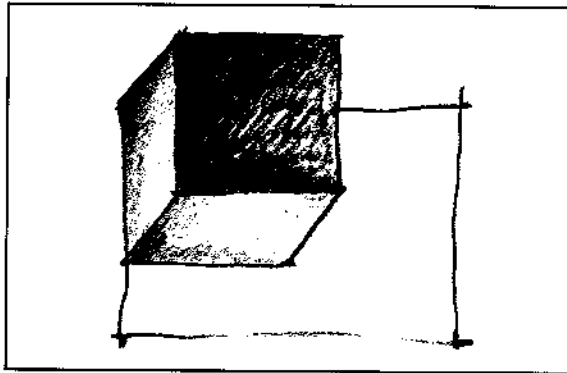
2.7

A white ell-shaped building on a black surface.



2.8

A black box-shaped building on a white surface.



2.9

Aerial photograph, the Ohio State University Oval, 1948, The Ohio State University Archives.



dimensionality, of the structure displaces space rather than defines its boundaries. Even in these cases, the building is engaged in a taut relationship with its surroundings. Tensions are created between object-buildings and edges, among several object-buildings on the site, among natural features in the landscape and even by the varied sweep of the topography. Nothing in the built environment operates in true isolation from context. An important task for architects is to understand what relationships are present on the site and how the placement of their buildings can enhance these relationships and make apparent even more affinities of space, form and order.

While some buildings clearly function to define space and others function as free-standing objects, even more frequently buildings have a hybrid character. Such buildings act partly as edges and partly as objects. This is true of elements at the Cranbrook School like the central tower, whose extreme verticality sets it off from the edge-building it adjoins. The tower also acts as a center to the space in front of it. A clearly delineated, rectangular extension of space is aligned with the tower, distinguishing the ideal order established by the tower from the more rambling, picturesque assemblage of space that characterizes the campus as a whole.

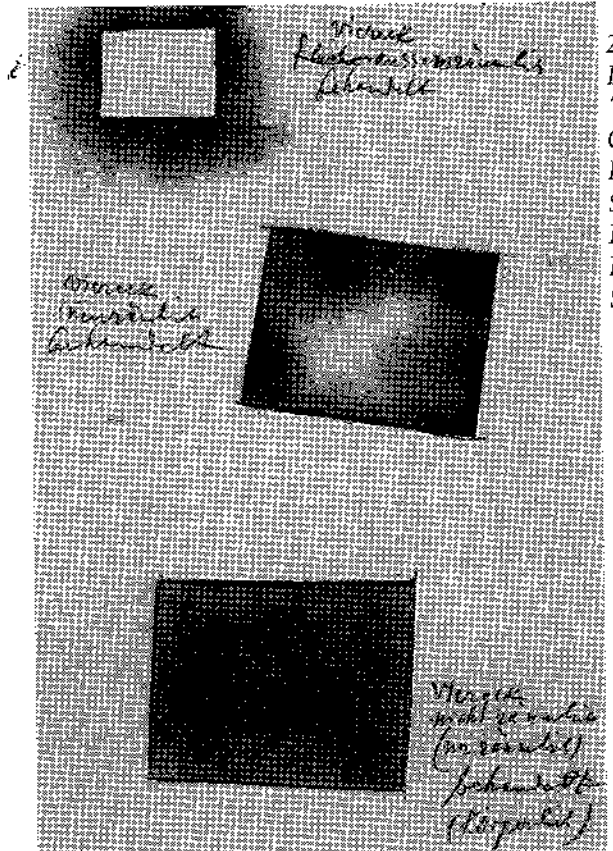
Returning to Figure 2.2, it is now possible to interpret the drawing as a very simple architectural plan indicating the interplay of open and occupied space. This kind of drawing is called a **figure/ground** diagram. If one identifies the black area as mass and the white area as open space the drawing reveals an ell-shaped building and the land it sits upon. By reversing the assignment of mass and void in the drawing,

the diagram yields a free-standing rectangular building at the corner of its site. Yet another reading of the drawing is available if we are more abstract in our interpretation. The diagram can represent a large exterior space like the **Oval at the Ohio State Campus**. Even though the space is of a vast urban scale and the edges are not defined by a continuous, unbroken wall of buildings, the Oval is more imaginable and memorable than any of the buildings that bound it.

A drawing by **Paul Klee**, "*Innerspatial-Outerspatial*," illustrates the ability of a single two-dimensional form, the rectangle, to describe opposite spatial conditions. The topmost rectangle shows how a crisply defined center can organize a loosely structured perimeter, rather like a fried egg, ("outer-spatial," in Klee's terms). The middle drawing, on the contrary, shows how a clearly drawn perimeter can hold within it a loose arrangement of form, rather like a sliced tomato, ("inner-spatial" in Klee's terms). The lowest rectangle is ambiguous. The two-dimensional drawing does not give us sufficient information to determine whether we are seeing a dark void cut out from a light background or the reverse, a black rectangle placed on a white background.

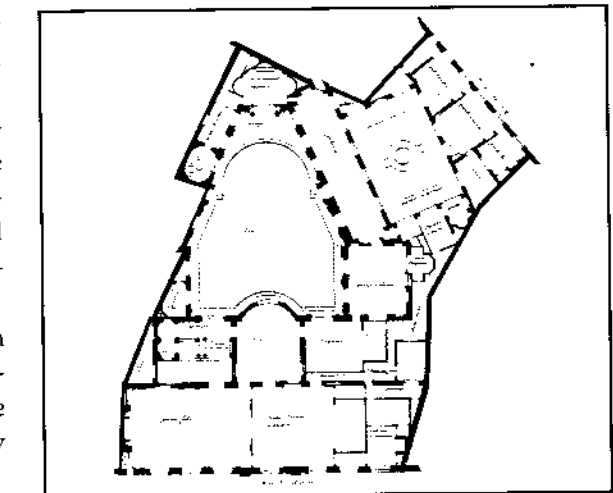
It is easy to read Klee's drawing architecturally. Two paradigmatic building types can be defined respectively by Klee's top two drawings; the **palazzo** and the **villa**. The third illustrates the interrelationship of the two building types through a figure/ground reversal.

Unlike American cities and suburbs which are frequently comprised of free-standing buildings surrounded by lawns or parking lots, the built fabric of old European city centers is very



2.10

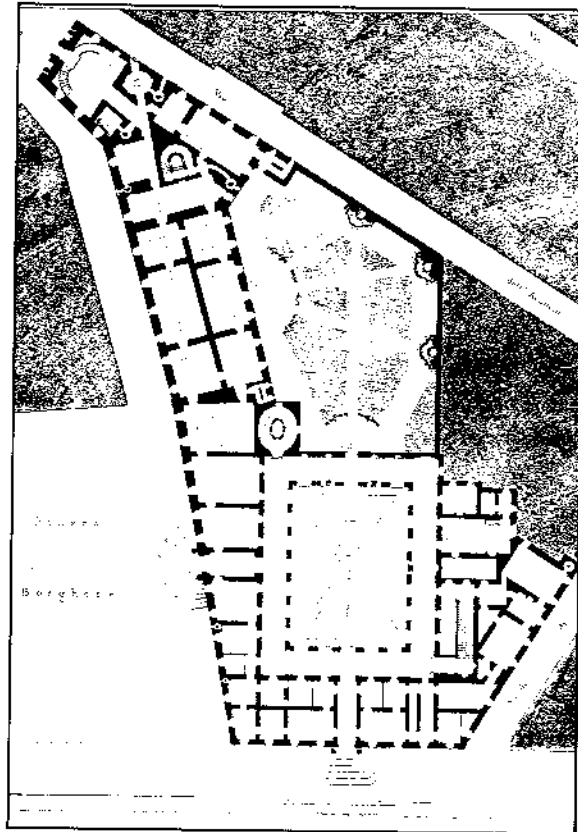
Paul Klee, "*Inner Spatial-Outer-spatial*." Paul Klee-Stiftung, Kunstmuseum, Bern, Switzerland.



2.11

Antoine Le Pautre, *Hotel Beauvais*, Paris, France, c. 1654.

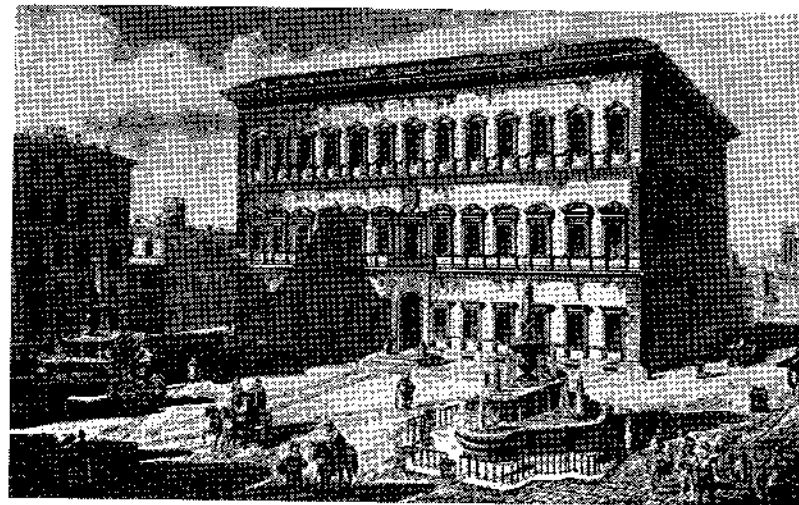
2.12
M. Longhi & C.
Rainaldi, Palazzo
Borghese, Rome,
Italy, c. 1671.



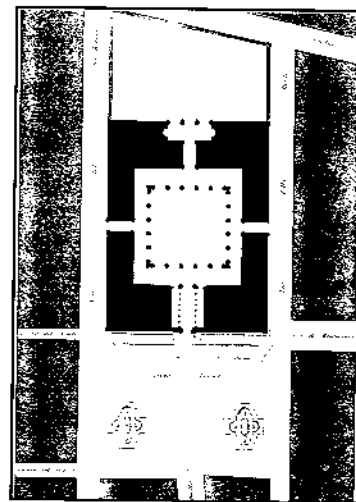
dense. Streets are often quite narrow, buildings share common 'party walls,' facades of buildings join together to define a continuous edge along the street, making them seem like canyons. It is difficult to situate clearly defined object-buildings into such a fabric. Instead, the urban fabric is punctuated by shaped voids. The clear geometric form of courtyards and squares is preserved while the internal organization of buildings may be irregular in response to contingencies of site or program.

The Palazzo Farnese by Antonio da Sangallo the Younger (1485-1546) and Michelangelo Buonarroti (1475-1564), clearly illustrates the formal organization of the palazzo type. Like all palazzos, it is organized around a very clearly defined central courtyard. However, unlike most palazzos, the site of the Palazzo Farnese occupies an entire city block. The perimeter wrapper of the palace reflects the form of the center, resulting in a kind of extruded 'square doughnut.' More typical are palazzos in which the perimeter is rendered ir-

2.13 Left:
Michelangelo
Buonarrotti and
Antonio da
Sangallo the
Younger, Palazzo
Farnese, Rome,
Italy, c. 1517,
perspective.

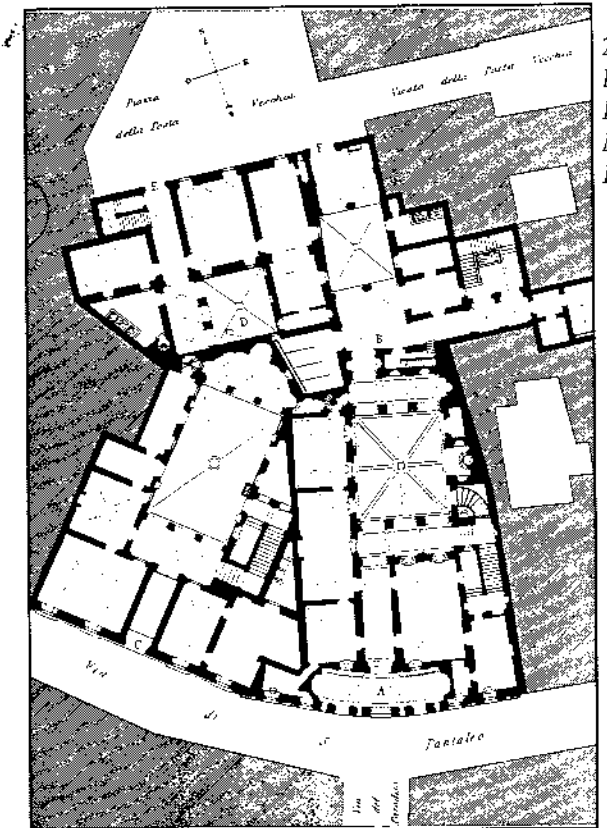


2.14 Right:
Palazzo Farnese,
plan.

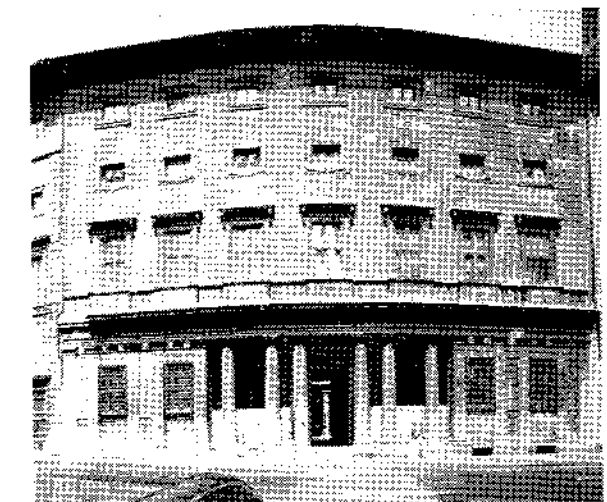


regular to effect a gradual transition from the perfect geometry of the center to the more irregular adjacent conditions. The Palazzo Borghese and the Hotel de Beauvais are extreme examples of urban buildings which are organized around idealized centers. In contrast to the regularity of the center, the perimeter is stretched, bent and pulled to adjust to local site conditions.

Baldassare Peruzzi's (1481-1536) Palazzo Massimo, is a double palace for the brothers Pietro and Angelo Massimo, with Pietro's palace at the right and Angelo's at the left in the complex. Idealized central courtyards organize a highly irregular wrapper. The facade of the Palazzo Pietro Massimo bends gently along the curving street. Its main entrance is carved into the block of the building, allowing the street wall to remain undisturbed by the intrusion of a porch. This recessed entrance vestibule, or *portico in antis*, does not align with the center of the courtyard, but shifts beyond the boundaries of the palace to align with the axis of a minor street. A new center to the building is established. As the path slips into the side of the courtyard, yet another re-centering takes place. At the far end of the courtyard a slight rotation of the building's axis occurs in response to the site conditions at the back of the building. Palazzo Angelo Massimo likewise undergoes subtle readjustments as the building wrapper mitigates between the ad hoc order of the surroundings and the clear geometry of the courtyard. Two ordering systems are operating at the same time. An urban order of street alignments, axes, open spaces, property lines, and adjacencies exerts pressure on the exterior envelope of the building, causing many local

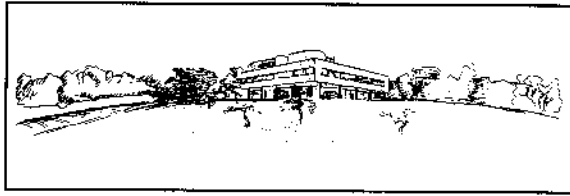


2.15
Baldassare
Peruzzi, Palazzo
Massimo, Rome,
Italy, c. 1532.

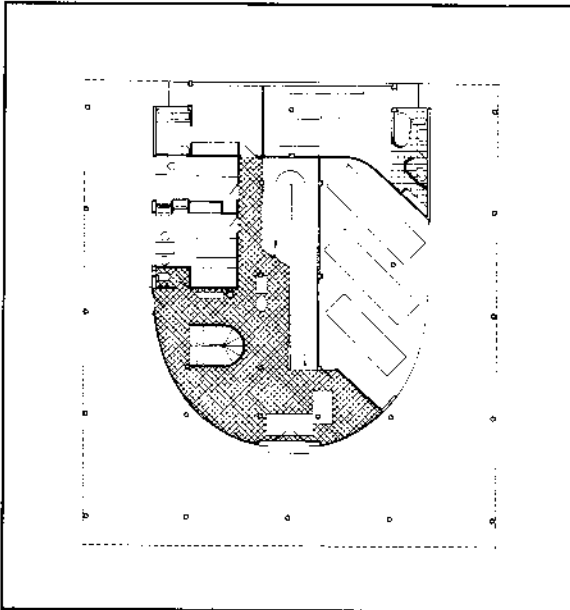


2.16
Palazzo Massimo,
elevation.

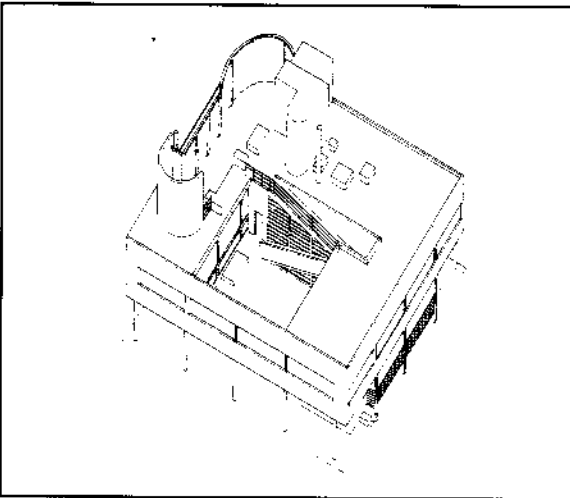
2.17
Le Corbusier,
Villa Savoye,
Poissy, France,
1928-31.



2.18
Villa Savoye,
ground floor
plan.



2.19
Villa Savoye,
axonometric.



adjustments to be made. Yet the ideal order of the void, the palazzo courtyard, governs the spatial organization of the interior of the building. The two systems are melded together through the use of hinge-like spaces carved into the *poché*, **local symmetries**, and a series of deformations and re-centerings.

The carving out of figural spaces is a strategy for bringing order into dense, congested urban fabrics. When operating in the countryside, the task of the architect is quite different. Here open space is abundant and order is established through an opposite gesture: the insertion of figural, free-standing buildings into the open spatial continuum. Le Corbusier's *Villa Savoye* at Poissy is an example of such a building. As a form, the Villa Savoye is almost a perfect white rectangular prism, a platonic solid, whose sharply defined geometry sets it off as an alien entity on the open meadow. The pristine purity of the villa is carried so far that the box does not even touch the ground. Rather, the main volume of the building is suspended off the ground on a field of columns called *piloti*.

While the perimeter of the villa is strongly determined by the geometry of the box, the interior is not. As in Klee's second diagram, the clarity of the perimeter acts as a datum which makes possible a freer arrangement of walls and objects within its boundaries. Indeed, the architectural critic Douglas Graf has constructed a series of fanciful **transformational diagrams** which suggest that the plan of the Villa Savoye was generated through the operation of turning the Palazzo Farnese inside out. The Palazzo, a void ringed by a colonnade and a 'solid' cellular band of rooms reverses to yield

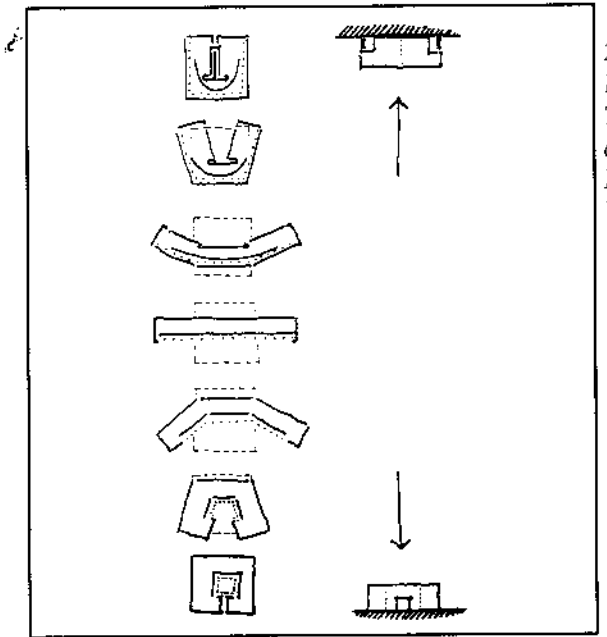
a 'solid' center ringed by a colonnade held within a voided boundary.

The *Villa Rotonda* by Andrea Palladio (1508-80), c. 1566, is a more classic representation of the villa than Le Corbusier's contemporary rendering of the same theme. A free-standing object with identical porches on all four sides, it is an autonomous object on an open landscape. Inscribed within a perfect square, the disposition of interior space is governed by a nine-square grid whose central cell is expanded to receive the dome, further reinforcing its centrality around a point.

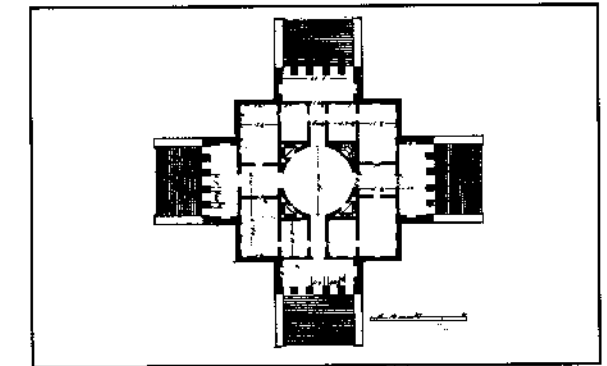
The simple nine-square order of the villa permits a wide range of variation so that the ideal paradigm may transform into a more hybrid condition. Like The Villa Rotonda, Palladio's *Villa Emo* of 1564 is a pure rectangular volume whose interior is organized by a nine-square grid. However, in the Villa Emo instead of a spatial expansion at the center, there is a contraction as the service stairs pinch inwards. The nine-square grid no longer operates with equanimity in all four directions. The pinched center sponsors an extension of the central bar into lateral wings. A clear division between front and back is established, engaging object and edge.

At Filippo Juvarra's (1678-1736) *Villa Stupinigi* of 1729-33, the status of the villa as an autonomous, free-standing object is even further called into question. The central structure can still be understood as a nine-square grid, but the corner cells have been pulled diagonally, engendering a radial disposition around an enlarged center. Indeed, the extended diagonal arms spawn new clusters of radial arms so relentlessly that a great figural space enclosed

2.20
Douglas Graf,
Transformation
of Palazzo
Farnese into the
Villa Savoye.



2.21
Andrea Palladio,
Villa Rotonda
(Villa Capra),
Vicenza, Italy,
c. 1566.



2.22
Villa Rotonda,
view.

