

APPENDIX 3

PERMUTATION AND TRANSFORMATION: THE SPATIAL SIMULTANEITY OF FIGURE AND FIELD

Paul James Armstrong
Visiting Assistant Professor

Dale Burgess Poynter
Visiting Assistant Professor
School of Architecture
University of Illinois at Urbana-Champaign

In 1939 Mies van der Rohe brought a relatively unknown Bauhaus master photographer to teach at the Armour Institute in Chicago. Mies needed a disciplined teacher who had high standards, a visual thinker who had tested technical skills, and a well-educated person who could build a basic design curriculum on a philosophically sound basis. Trained in mathematics and philosophy, Walter Peterhans was a photographer of unsurpassed technical skill and just the person Mies required to institute the Visual Training course.

Peterhans developed a series of two- and three-dimensional exercises based on figure/ground relationships to teach students lessons about the creation of form, proportion, color, texture, and space. Peterhans wanted the exercises "to present visual qualities and relationships in a pure form."¹ Visual Training is founded on a platonic concept that beauty is subjective rather than objective and that the role of education is to awaken the subject to his or her own insight. In Peterhans' words, the exercises were "to be abstract enough to reveal visual qualities isolated from one another" and "raised out of the manifold involvements in which they generally occur in architecture, in industrial forms and in the fine arts."²

Although not literally based on Peterhans' Visual Training exercises, the Figure/Field Permutation exercise is premised, at least in part, upon similar platonic principles of proportion, form, scale, and spatial thinking encompassed by Peterhans' course. Developed for beginning design architecture

students, the Figure/Field Permutation exercise is conceived in two parts: the first component focuses upon the graphic composition and permutations of paired geometric shapes and their integration within a constant geometric field through the application of tonal values. The second component explores the three-dimensional implications of one of the selected graphic compositions through modeling techniques.

The beginning architecture student is confronted with a plethora of design issues and is equipped with an extremely limited vocabulary of design related principles and techniques. Having little or no background from which to analytically assess and evaluate the built environment, the beginning design student must gradually assimilate both the technical skills and, most significantly, the aesthetic concepts and principles to effectively communicate design intentions and to provide a rationale for design decision-making. The Figure/Field Permutation exercise, therefore, is one of several highly focused exercises designed to acquaint beginning design students with specific design criteria, principles, concepts, and skills.

According to Francis Ching, comprehension of the structure of a visual field is assisted by the organization of heterogeneous elements into two opposing groups: positive elements that are perceived as figures, and negative elements that provide a background for the figures (field). The perception and understanding of a composition depends on the interpretation of the visual interaction between the positive and negative elements within its field. Therefore, figure and field form an inseparable reality a "unity of opposites," just as the elements of form and space together form the reality of architecture."³

The relationships between figure and field can be ordered by geometry (i.e., the grid) and/or by topology. The Greeks, for example, employed both ordering systems: the grid for town planning and topological organization for temples and sacred places. Christian Norberg-Schulz postulates that the seemingly haphazard and irregular distribution of Greek temples, and the arrangement of space outside buildings, have led some critics to the conclusion that Greek buildings are "nonarchitectural" and have to be perceived as "large sculptures." Although the temples appear as clearly organized individual bodies, this unsatisfactory interpretation of the siting of Greek temples is probably due to the use of insufficient space concepts.

Vincent Scully, for the first time, brought the Greek Temples to life as individual concretizations of fundamental existential situations. Whereas the beauty of the temple as an aesthetic object has resulted in interpretations in terms of stylistic development or as an expression of the wish for visual refinements, it is essential to understand the temple in relation to the total situation under which it was created. That is, it had to be related both to its site and to the purpose it had to serve. Scully confirms the generally recognized fact that the regular buildings and the free distribution are complementary aspects of the same basic intentions. Furthermore, he also explains this intention in terms of Greek religious and philosophical concepts.

Greek sacred architecture is, basically, an architecture of plastic bodies and that their seemingly haphazard distribution has a meaningful spatial function in relation to the surrounding landscape. However, it is evident that the implied spatial organization cannot be described by means of the concepts of geometry and symmetry which determine the individual Greek building, and which are employed to describe spatial relationships. Greek space is therefore

characterized by its "heterogeneity." It is determined by a multiplicity of modes of organization, unlike Egyptian architecture which is ruled by the same laws on all environmental levels. Therefore, Greek space is ordered "topologically" where organizational modes interact in different ways according to the particular situations, producing totalities which have a pronounced individual value within a general system of related meanings.⁴

The purpose of the Figure/Field Permutation exercise was to explore the simultaneous visual interaction of figure and field, "a unity of opposites," through the dynamic interpenetrations of geometric shapes organized on a field using regulating lines and orthogonal ordering systems. In analytic cubism, the relationship between figure and field is unified through the simultaneous perception of forms in space and their composition within the two-dimensional picture plane of the canvas. The consequential spatial ambiguity is a result of the simultaneous observation of form from different perspective vantage points and the corresponding translation of the perceived realities to a two-dimensional field. The spatial field tilts, objects are viewed simultaneously in plan, elevation, and section, and the classic distinctions between figure and field are blurred as the figure and field merge into a comprehensive compositional structure.

Students were required to compose paired geometric shapes or "figures" (i.e., circle and triangle, half-circle and square, square and parallelogram) within a series of six inch squares or "fields" organized on a 15" x 20" illustration board. To ensure geometric harmony, each shape was to be proportionally related to the field. The proportional relationship of the figures to the field and their compositions within the field were to be defined through the implementation of regulating lines and orthogonal ordering systems.

The implementation of the regulating lines assured that the individual geometric shapes would be proportionally derived from the geometry of the field and also allowed students the opportunity to explore non-orthogonal spatial ordering systems. By retaining the regulating lines as compositional elements, the simultaneous expression of the unity and integration of figure and field was realized. The simultaneous interaction of figure and field and the implications of the design process were further explored through permutation and transformation of the composition of each of the eighteen squares.

Ching writes that all other forms can be understood to be transformations of the platonic solids and that the variations are generated by manipulations of their dimensions, or by the addition or subtraction of elements. Once the figures with their regulation lines were composed within each square, students were given a palette of three values of grey plus black and white to apply to each composition. Each composition was conceived as a permutation of the previous composition. With the addition of the tonal values, students could investigate a dimensional relationship implied through the articulation of interpenetrating planes. The use of the regulating lines as a compositional matrix suggested the two-dimensional continuity of the figure within the field through their extension to the perimeter of the square. Composite layers of geometric planes began to suggest transparency, intersection, overlap, and continuity within the spatial field which could be defined through a systematic application of tonal values. Heterogeneous compositional pieces could be unified and articulated through discreet placements of tonal values for compositional and spatial effect. The result was a harmonious network of lines and planes compositionally unified by the convergence of figure and field and balanced by proportionately distributed tonal values.⁶

The cubist explorations in painting were immediately transferred to sculpture. Unlike painting which could resolve the unification of figure and field as a simultaneous expression of multiple vantage points in two dimensions, cubist sculpture was principally concerned with the figure itself. In sculpture, space is a literal, palpable phenomena and the interaction of the figure within a field, its spatial context or environment, is immediately perceptible. Cubist sculpture creates dynamic, three-dimensional juxtapositions of forms and planes as objects seem to twist and rotate upon themselves in space. As in cubist painting, sculpture takes on a faceted, fragmented appearance as planes abruptly change direction, overlap, and converge.

Perhaps the most convincing and original integration of the cubist principles of spatial organization with architectural form were the "merzbau" sculptural environments constructed by Kurt Schwitters in his house in Hanover between 1924-1933. Although the "Merzbau" does not exist today, photographic documentation attests to the comprehensive resolution of a prototypical cubist architectural/sculptural environment in which the conventions of figural space--a uniformly proportioned space "contained" or defined by a regular, orthogonally derived geometric order--are subsumed by irregular, ad hoc juxtapositions of forms and planes which do not conform to the "functional" spatial conventions of floor, wall, and ceiling. Although highly idiosyncratic, Schwitters' improvised sculptural environments synthesized the intrinsic relationships of sculptural expression with architectural form. As William Rubin asserts, with the blurring of the discreet pictorial field of the collage on the wall and the extension of the relief material out into the room, Schwitters' improvised environment gradually obliterated the architectonic sense of the house. The "merz" accumulations began to be surrounded by an organic growth of wood and plaster which in time extended through two floors of the building and down into

the cistern. As this shell was realized it became increasingly Constructivist in style, in keeping with the general orientation of Schwitters' art in the mid-twenties. Schwitters' "Merzbau" anticipates by nearly half-a-century the combines of Robert Rauschenburg and the architecture of Bruce Goff and Frank Gehry.

The second component of the project represented the translation of the two-dimensional graphic interpretations into three-dimensional form. Like Schwitters' "merz" constructions, the students' collaged spatial ideas, at least in two dimensions, seemed to imply dynamic interpenetrations of planar forms with spatial implications. From their studies involving the application of tonal values, the students had already begun to articulate spatial relationships through the implied advancing and receding planes which resulted. The translation from graphic composition to sculptural form was not that difficult.

Each student was required to select one of his or her graphic compositions and interpret it in three-dimensions. Initially, the students worked on crudely fabricated study models in reference to the selected composition. The design process began as a literal interpretation of the graphic composition. However, as they worked new possibilities and unforeseen complexities emerged. First, the scale of the model was twice the scale of the drawing. The increase in scale made it easier to fabricate the model and also helped to clarify spatial ambiguities implied in the graphic two-dimensional composition. After a certain degree of trial and error, a maximum height of 2 1/2" and a minimum base depth of 1/4" was imposed. Limiting the maximum height seemed important because the emphasis of the model was on the compositional and sculptural properties of form, not volume. Furthermore, there was an explicit desire to

limit elevational considerations concentrating instead on the expression of pure geometrics. Even with such proscriptions, students were able to spatially articulate the interpenetration of planes and forms in imaginative and innovative ways.

The requisite monochromatic color of the models imbued them with a uniform neutrality placing emphasis upon the formal resolution of the sculptural composition. The tonal values of the graphic compositions were directly reinterpreted in the three-dimensional constructs. Furthermore, the models, like the graphics, became instantly recognizable for their sculptural, abstract aspirations and were less likely to be regarded from a metaphoric point of view. In the final analysis, the models became the three-dimensional interpretations and transformations of the graphic compositions. Within the context of the two- and three-dimensional investigations of the unification of figure and field, students were able to discover compositions derived from the interactions and regulating lines as spatial organizers within a given field. Through tonal variations, spatial depth could be suggested and compositional balances of tonal values and planes could be articulated. The application of tonal values further unified figure/field relationships, defined geometries, and suggested spatial qualities through the perception of advancing and receding planes of opposing tonal values. Ultimately, the model served as the definitive link between graphic analysis and ideation to three-dimensional realization as the sculptural embodiment of planar hierarchies and compositional order.

This is not to assert that the design process is linear and that its natural progression is or should be from drawing, to model, to built form. In subsequent projects, students have investigated the design process in other

ways--even reversing the order beginning with the model and terminating with graphic representations of design intentions. The value of the project as a pedagogical device lies in the fact that it can be directly related to architectural and artistic precedents, from the Greeks to the modernists, which sought to unify heterogeneous architectural forms through the simultaneous perception of figure and field and that it reaffirms and demonstrates fundamental principles of spatial order through the dynamic manipulation of proportionately related geometries.

NOTES

1. Domer, Dennis E. Walter Peterhans and the Legacy of Visual Training, Fostering Creativity in Architectural Education: Proceedings of the ACSA West-Central Regional Conference, 1986, p. 22.
2. Ibid., p. 22.
3. Ching, Francis D.K. Architecture: Form, Space, and Order, Van Nostrand Reinhold Company, New York, 1979, pp. 64-73.
4. One of the basic facts of the Greek environment is the individual character of places. Places were manifestations of archetypal characters. Greek sanctuaries are determined by the character of the place, the "topos," and do not admit any geometrical grouping of buildings which would symbolize a more abstract, general order. Buildings are individual units representing archetypal human characters which participate in the situation symbolized by the site.

The Greek concept of space is pluralistic. For the Greeks space was not "one" thing, but "many." According to Norberg-Schulz, this pluralism liberated man from the constraints of an all-comprehensive system, and allowed him to transcend the world of casual improvisation. The harmonious interaction of different modes of spatial organization in Classical Greek architecture was the product of an historical development involving the transformation of organizational orders. From their common point of departure, the megaron, the temple and the dwelling moved in opposite directions. The temple became ever more a manifestation of a well-defined character, whereas the house developed toward functional differentiation.

The choice of different spatial organizations according to each individual situation was never casual; it happened within the limits of an integrated language of building types and means of articulation ("orders"). The individual phenomena of daily life were seen as manifestations of interacting archetypes or "ideas" in Classical Greek thought. Plato represented these ideas as absolute, and argued that man ought to consider them the ideal of perfection. In Greek "cosmos" means beauty as well as order. Platonism seeks the key to natural phenomena in perfect final causes.

Norberg-Schulz, Christian. Meaning in Western Architecture, Rizzoli, New York, 1981, pp. 21-41.

5. Rubin, William S. Dada, Surrealism, and their Heritage, The Museum of Modern Art, New York, 1968, p. 56.

6. Since Vitruvius architects have been trying to develop metrical relations which would give an ideal order and structure to architectural form including the facade, floor plans, and elements such as doors, windows, stairs, and columns. This was thought to be the way of achieving absolute beauty. Especially in the Renaissance, such attempts were referred to systems of numbers and rules of proportion.

In Elements of Architecture, Rob Krier contends that the aim of achieving a harmonious beauty cannot be reached only in this way. If one considers the oblique view given at the base of a building, together with the constantly changing contrasts and effects of depth caused by light and shade, prevent us from perceiving such truly calculated proportions exactly. Nevertheless, it seems important to examine window proportions with the golden section, and equally to study the proportions of opening and parapet, base and total height, etc. In time, a "natural" sense of pleasant, harmonious proportions will emerge, e.g., a well-balanced composition.