Buchbesprechungen

Terry W. Knight, Transformations in Design: A Formal Approach to Stylistic Change and Innovation in the Visual Arts
Cambridge University Press, 1994, 258 pages, 119 illustrations

Shape grammars are languages of two- and three-dimensional forms analogous to spoken languages. A great deal of attention has been centered on them as a basis for supporting design with computers. They are sets of rules which can be used to create families of visually related designs. Each design, in the family of possible designs that can be created by a set of rules, is generated by successively applying rules from the set to the current state of a design until no more rules are applicable. A rule may be applied if certain shapes specified by the rule exist in the current state of the design. After application of a rule, the specified shapes are substituted with one or more replacement shapes specified by the rule thereby adding, subtracting or modifying shapes in the current design. From a single initial state many alternative designs can be generated because there is usually more than one applicable rule at any stage.

Following Stiny and Gips, who first applied the concept to architecture and works of art in the early 1970's, two major streams of investigation concerning them have developed (1). One applies and develops the theory to generate two and three-dimensional shapes with the aid of computers. The other uses the theory formally to characterize artistic work in specific styles without the aid of computers. Terry Knight's Transformations in Design is in the latter tradition. It attempts to describe the transition from one style to another in any visual art. In so doing it claims to present a new approach to modeling stylistic change, an approach capable of addressing both the traditional questions of the historian, but with more formal rigor, and the means of structuring innovation for the designer, but with more power. The new approach involves shape grammars for style and stylistic changes as transformations of these shape grammars. The importance of this book, even if the new approach falls short of expectations, is that it allows the reader to judge the usefulness of the current state of shape grammar theory.

The book is divided into three parts. Part I reviews previous writings on theories of style primarily from the eighteenth century to the present, Part II introduces the theory of shape grammars and new concepts for analyzing stylistic change consisting primarily of transformations of shape grammars, and Part III consists of case studies where the theory of Part II is developed to represent formal aspects of the designs of works of art in three areas: Greek Geometric pottery, de Stijl art, and Frank Lloyd Wright's Prairie and Usonian houses. In this review I will limit myself to the most purely architectural parts of Knight's discussion.

First, an overall observation: if the promise of this book is substantial, the reality is somewhat less so. My reservations do not lie in the shape grammar theory itself because the presentation of the theory in Part II is sound. The disappointment lies in the realization that the claims made at the beginning of the book are not substantiated by the case studies in Part III. In fact, the author derives no conclusions from the representations of stylistic change that are developed for each of the case studies. If it were not for her claims at the beginning of the book and the sweeping summary of previous writings on style theory, for which Knight's theory is presumably the inevitable culmination, one could be quite happy with Knight's more modest claim that the real text of her book consists of the shape grammars themselves.

The author reviews well-known writings by James S. Ackerman, Winckelmann, Wolfflin, Alois Riegl, Gottfried Semper, Adolph Göller, Paul Frankl, Hans Sedlmayr and Emil Kaufmann. Also mentioned are historians outside the German tradition such as Benedetto Croce, Henri Focillon and George Kubler. An insupportable bias of this section is that theories of style show an evolution with time from vague, qualitative theories towards rational, abstract and precise theories. They move, says Knight, toward a grammatical approach foreshadowing shape grammars. Knight therefore seized on Semper's analogy between the
building examples which appears in a simplified form in the second volume of his Précis, these were not intended to provide any explicit compositional system but rather to convey general principles. What Durand actually wrote in his Précis is that design consists of the following sequence: firstly, the composition of the ensemble which is begun with a sketch (croquis) of the major and tertiary axes, secondly, the outline of the partis (major building spaces) on these axes, and, lastly, the addition of the elements of architecture such as walls, columns, pilasters and doors. There are no explicit (or even implicit), general instructions as to how to compose an ensemble.

Durand’s method of axial composition was the design approach of the Ecole des Beaux-Arts, the dominant force on architecture in the nineteenth century. His influence was such that Guadet writing at the end of the century echoes Durand in his »Elements et Théories de L’architecture«. As Banham has noted, Guadet’s method in which »... small structural and functional members (elements of architecture) are assembled to make functional volumes, and these (elements of composition) are assembled to make whole buildings, « was common to academics and moderns alike. It was precisely the general nature of this mode of composition that paved the way to abstract composition in the Modern Movement. The Werkbund Pavilion of 1914 by Gropius and Meyer is a good example of the Beaux-Arts method. It has the symmetrical major and tertiary axes of the school, but the elements of composition consist of radical new forms (6). As such it is a transitional building falling between the Beaux-Arts method and the completely free composition of, say, Gropius’ Bauhaus of 1925–26.

With respect to Knight’s second claim, it appears that Semper’s alleged conflation of type and style derives from a mistranslation of the German word »Typ«. Semper used »Typ« interchangeably with »Motif«, in the English sense of a design motif. To him, a work of applied art, such as a carpet in a particular style consists of a number of motifs, or Typen, which together constitute the work. They are not in any sense to be confused with building types or any other types (7).

The second chapter of Part I is concerned with twentieth century developments. It takes the language
analyses of the nineteenth century and applies them rigorously to design. By adapting Noam Chomsky’s work of the 1950’s on the characterization of natural languages by generative grammars, Stiny and Gips had promulgated the notion of shape grammars to characterize style in languages of two- and three-dimensional designs. Since the early 1970’s they have had several collaborators and followers, including Knight, who have published examples, which are summarized and illustrated in this chapter. These seem to support the viability of the shape grammar concept. Among the examples shown are Palladian villa plans, Frank Lloyd Wright Prairie houses, Japanese tea rooms, Moghul gardens, and Hepplewhite chairs. While the examples are impressive at first glance, they do raise questions when one begins to look more closely. For example, of the four new Palladian plans illustrated, three are in varying degrees un-Palladian. Villa Hollywood, which has two rooms spanning the entire width of the Villa, is totally un-Palladian. In the Villa Vine all the rooms, including the central sala, are roughly of the same area and dimensions thus contravening Palladio’s principle of varying room sizes and of making the sala larger than the other rooms in at least one dimension. Villa Santa Monica is missing the small rooms, called camerini, used to contain stairs, studies, washrooms or storage. The Prairie grammar only covers the overall massing, some of the inflections of the external form, the hipped roof forms, the internal functional zoning and the location of the main fireplace around which Prairie house designs revolved. The openings, by the way, were all established without the aid of the grammar. Since the shape grammar supplies so little, one must ask, what, at this general level, distinguishes these designs from those of Walter Burley Griffin, Marion Mahony and William Drummond.

The reason the generated Palladio designs have un-Palladian features is that it was assumed that if the known examples of Palladio’s work can be generated by the grammar then any new designs generated by it would also be Palladian; that is, they would be what Palladio might have designed. Obviously, the un-Palladian features disprove that assumption. Additional rules or constraints are needed. Also, both the Palladian grammar and the Prairie House grammar avoid the interaction of earlier rules with later rules because they represent only the most fundamental design moves where such interactions are not involved. Only when shape grammars work at the level of a completed work rather than a preliminary assemblage, will they produce architecture. In view of the sequential nature in which shape grammars are applied to develop designs, this latter objective may be difficult to achieve.

In looking at Wright, Knight demonstrates in Part III how a simplified version of the shape grammars worked out by Konig and Eizenberg for Prairie Houses (which deal only with the functional zones such as living, service and bedroom areas), can be simply transformed to yield Usonian houses (the polliwog schemes). While this is not obvious because of the difference in visual appearance and size between the two types of houses, the shape grammar approach makes the relationship between them entirely convincing in terms of transformations. The transformations affect three areas: change in the position of the fireplace in the living area, change to a right angle in the spatial relation between the service and living areas (thus forming the characteristic L shape of the core of the house), change of service area to bedroom area, inclusion of the kitchen in the living area, and optional extensions to the living or bedroom areas of the core - extensions aligned with the longer axes of the corresponding core units (living or bedroom). Fundamentally these transformations do not change the relative locations of the functional areas with respect to each other, proving that behind appearances, Wright maintained a consistent philosophy for the layout of his houses (though that is likely true of many other architects).

Shape grammars are especially suited to generating all possible designs incorporated in a grammar. Thus Knight is able to produce all possible layouts for polliwog Usonian houses. It would be stretching credibility, however, to believe that the Usonian grammar (even with the associated ornamentation rules such as those that inflect corners, add secondary fireplaces, and allow interpenetration of zones), constituted designs for Usonian houses. As in the case of the de Stijl grammars, the Usonian grammars represent
only a part of the formal geometry. Given that the Usonian grammars are parametric (that is, they leave open the question of allowable dimensions), they say nothing about proportional relationships (other than setting a limit on length to width of core areas) and nothing about the relation between external form and internal design. As noted earlier, true design begins when the interrelationships between all components are considered simultaneously. For this to happen, the Prairie and Usonian grammars must be extended beyond massing and roof shapes to include basic floor plans and elevations. This would imply a degree of complexity in the rules that would stretch human comprehension and would probably require verification by computer.

While it is understandable that the author should be impatient with seemingly vague theories about stylistic change, she does seem to lack insight in matters that cannot be quantitatively expressed.

The specific reason that the case studies do not lead to conclusions or insights concerning stylistic change is that Knight’s shape grammars remain too primitive and do not capture the essential visual characteristics of each stage. Perhaps her assumption is that if one can demonstrate the mechanics of stylistic change at this most basic level with very simple grammars, then it is theoretically possible to study the problem with more complex grammars. Yet Knight attempts to generate actual works of art with these simple grammars.

Two major difficulties in the application of shape grammars to stylistic change surfaced in the case studies. The first is that the many complex, visually perceivable interactions between the elements of a work of art are not easily represented by shape grammars because of the sequential nature of their application. To illustrate the nature of these interactions here is a quote from Max Bill writing about Vantongerloo:

»I see a flower. It gives me the impression of beauty. I would like to paint it. In this moment I see the theme of flower changed. It is no longer the same beauty. Is it the surroundings? Is it the light? So I attempt to solve the problem, the theme of flower. In executing the painting I search for the order of the surface; for the value of the color in relation to another one, for its harmony. The same is true for the lines. This process is guided by the sensibility of the artist, and so there develops a work of artistic... or then of botanical value.« (8)

The second problem arises when the formal content of a work of art is not determined by a geometric logic alone but other by perceivable visual relationships (as in the late paintings of Vantongerloo). Perhaps it is possible to quantify these relationships with the help of the psychology of visual perception, although I suspect that artistic perception and sensibility are very complex. Until this becomes possible shape grammars are limited in stylistic analysis to works of art or parts thereof with a strong internal geometric logic. This explains the successful application of shape grammars to the meander patterns of Greek Geometric pottery and to floor plan typologies.

Thomas Seebohm

References: