METU JFA 1988
(8:2) 161-188

ANALOGICAL MODELS IN ARCHITECTURE AND URBAN DESIGN [1]

Chris ABEL

Received : 31.10.1988;
Keywords : Architectural Design, Architectural Theory, Analogical Models

1. This article was originally written in April 1984 as an introduction to theory of architecture, suitable for courses on that subject.

INTRODUCTION

In an earlier article, "Function of Tacit Knowing in Learning to Design" (Abel, 1981c), I suggested that design researchers need to pay more attention to the way architects actually create their designs, rather than relying on the idealized models of design processes dreamed up by themselves. This article is intended to help fill that need, and outlines the major types of analogical models used by architects, together with some straightforward explanations of the main concepts involved.

The assumptive philosophy underpinning the approach is based in part on what I have called "critical relativism" (Abel, 1980b), a philosophy best known by the works of Thomas Kuhn (1962; 1977) and Paul Feyerabend (1975). Other key sources include the writings of Gianbattista Vico (1968), George Herbert Mead (1934) and Ludwig Wittgenstein (1953) on language, Ernst Cassirer (1955) on culture-forms, Michael Polanyi (1958; 1966; 1975) on tacit knowledge, Hans-Georg Gadamer (1976) and Jurgen Habermas (1968) on hermeneutics, and Arthur Koestler (1964), Donald Schon (1963), Gordon Pask (1976) and others on metaphorical theories of innovation. This article therefore brings together in a simplified and summary form many of those theoretical constructs whose relevance for architectural theory I have explained elsewhere at greater length (Abel, 1968; 1980; 1981a; 1981b; 1981c; 1982a; 1982b; 1984; 1986a; 1986b), and which comprise the main elements of a comprehensive theory of architecture, and by extension, architectural education. It is also acknowledged here that architecture and urban design are historically related through the use of similar theoretical models, architects being influential at the larger scale of design activity. Though most of the examples given are drawn from Western architecture, the approach is suitable in principle for understanding other forms, particularly in the Muslim world, where there has been considerable cultural exchange with the West in past history as well as in the present.

FRAGMENTATION OF KNOWLEDGE

Despite all the lip service paid to architecture as a "holistic design activity" and so forth, educators and researchers are heavily reliant upon concepts and methods, such as the schemas used by Geoffrey Broadbent (1973) and by Arnold Friedmann *et al.* (1978), which aim to break down their complex subject into more

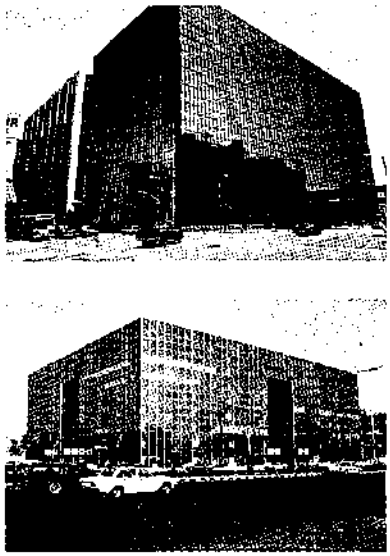


Figure 1, 2. Curtain-walled office building in Dallas, above, presents an identical image, irrespective of regional differences, to the building in Riyadh, Saudi Arabia, shown below (photograph by author)

manageable components. In my own classes, I have also found it convenient when referring to more specific aspects of architectural design, to use the following briefly defined categories of issues. Each is given below with its associated disciplines, which provide the main sources of relevant knowledge:

1. *Location* (geography, geology, ecology, climatology). Since all buildings, unlike other designed objects, must stand on some piece of ground somewhere, it is sensible to start with this category. Knowing the location of a building tells us what we need to know about such related factors as the climate, landscape, surrounding buildings, *etc.*
2. *Social form* (philosophy, anthropology, sociology, history, economics, politics). All problems of the function of a building derive from the kind of social forms and institutions involved, which define the accepted norms of behaviour and shared goals of the people who will use the building.
3. *Building type* (typology, morphology, planning). This category is closely tied up with that of social form, since a building type is identified whenever similar building forms are recognised as serving similar social functions.
4. *Technology* (engineering, building materials and construction). This category covers building materials, whether natural or man-made, and the manual or mechanical means by which they are produced and assembled into the completed building.
5. *Cost* (economics, quantity surveying, building management). Problems of the cost of building include not only the normal financial constraints on construction costs, but may also increasingly relate to the broader issues of the commercial viability of a design as a speculative development.
6. *Aesthetics* (philosophy, art). The last category includes all those especially difficult problems which have to do with how we judge a building to be visually pleasing or not. In a broader sense, it is that aspect through which architects have traditionally been most concerned with issues of the meaning of their designs for society at large.

However, though these and similar categories have their uses in helping teachers and researchers to develop partial studies of architecture in some depth, it is a gross error to believe that by simply totalling up the resultant specialised knowledge, we arrive at any kind of useful understanding of what architecture is as a subject in its own right. Worse, in no way do such taxonomies offer any kind of effective method of teaching students how to design a building.

On the contrary, by taking the untidy business of architectural design apart in this way and serving it up in the neater form of narrow specialisms (an expedient dictated as much by professional career demands as by intellectual shortcomings), attention is effectively diverted away from those essential attributes of architecture which serve to bind together all of its multifarious aspects. What this approach leaves us with then, is all parts, and no whole.

The central problem can be put this way. Using the above categories, we could easily come up with some long list of issues that any architect must deal with in order to design a building. In fact, these sorts of lists have been popular with many so-called design methodologists since the 1960s (Broadbent and Ward, 1969). However, if we try to do this on the basis of treating each issue as part of a separate category or set of problems, we cannot get very far without further vital kinds of information. For example, we do not yet know what importance to attach to any category or specific problem in relation to all the others. We could of course assume that they are all equally important, and that all architects treat all issues of design in a similar way. Theorists of an orthodox Modernist bent used to think like this and many teachers still believe this is the way to understand things. In this case, we would not need to know much more, and could analyze all buildings according to the same "universal" criteria.

But, things are just not that easy. Different architects, even at the same point in history, but especially at different times, can attach various meanings to each

Figure 3. Part of new campus designed by Sumnet Jumsai for Thammasat University near Bangkok, Thailand. Jumsai's regionalism is inspired by South East Asian "houses-on-stilts" as well as planning principles of the "temple city" of Angkor Thom, Cambodia. The design responds to both the local climate and landscape as well as the functional needs of a modern university (photograph by author)

of the categories and the issues they encompass, and the forms of their buildings differ accordingly. To take one of the most obvious examples, one architect may hold factors of location to be amongst his most important considerations, and will carefully design his building to suit the local climate and the built and natural landscape. Another will not only rely entirely on mechanical air-conditioning to control the internal environment of his building, but may also ignore the man-made and natural context in which his building stands. Instead, he may prefer to design his building as a large-scale sculpture, or even model it on the forms of the machines he relies on so heavily. In this case, "technology" acquires a special significance that differs in fundamental respects to the way the former architect might treat the "same" aspect of architecture. So without knowing how an architect interprets each of the categories and what values he places on them, our understanding of the process of architectural design is incomplete.

INTEGRATING IDEAS

The plain answer to this question is that a mature architect does not consider any of these issues separately at all. He designs a building according to his preferred *theoretical model* of architecture. This theoretical model constitutes an *a priori* system of integrating ideas or *interpretive framework* which largely predetermines all the relations between the different factors the architect must consider, and the values he attaches to any of them. And since there is a large number of quite different models to choose from in today's pluralistic culture, the system of relations between these factors will vary according to which model the architect is using. Therefore, unless we know the model an architect is using, consciously or not, it is quite impossible to understand the meaning and values he attaches to problems of location, social form, *etc.*, and the way he relates all these issues together in his design.

The idea of a theoretical model, as posited here, therefore provides the "binding agent" which holds architecture together and lends to it those holistic qualities so frequently referred to, but rarely accounted for.

I use "model" in both senses of the word as commonly understood. First, it can refer to a form of building, or even one specific building, which sets *standards* for others to emulate. But though the transfer of form and method from model to new building is therefore direct, the cognitive processes involved are little understood, since they involve tacit, as well as explicit forms of knowledge (Abel, 1981c). And although it is not widely acknowledged, this applies as much to the use of models by professional architects, as by the non-professional builders we associate with traditional societies. Distinctions between "self-conscious" and "unself-conscious" ways of building (Alexander, 1964) can therefore be extremely misleading, in so far as they direct attention away from the significant function of models in the *transfer of knowledge* of building from architect to architect in developed societies, as in less developed ones.

More accurately, what distinguishes the use of models in advanced societies from their use in traditional societies is the development of architecture, coincidental with the emergence of an historical awareness and professional recognition, to the point where it begins to acquire distinctive operational characteristics as a "form of life" (in the sense of Wittgenstein, 1953) in its own right (Abel, 1979; 1984). This results in what I shall call a potential "slippage" between the development of architecture and that of other culture forms. It is this degree of separation marked by historical awareness and professional evolution (apparent already in such complex pre-industrial cultures as ancient Rome) which largely provides architects with that extra room for creative manoeuver which is absent from those relatively closed societies we call traditional (Briggs, 1974; Kostof, 1977). In these circumstances, the relations between architecture and other culture forms are properly described in the terms of a creative interaction or "dialogue" between distinctive forms of life, rather than in the isomorphic terms we use to describe the highly integrated culture forms of traditional societies.

It is in this more open cultural environment, that we find the emergence of the second kind of model. This kind involves a process of abstraction, whereby certain essential characteristics of one thing, the model, are used to provide a *conceptual basis* from which something new may be developed. For example, the contrasting architectural attitudes towards local factors of site and climate mentioned above derive, in the one case, from analogies with known characteristics of organic forms, and in the other, with Modern abstract sculpture, or the properties of machines.

All theoretical models, even in science, are based on analogies of this sort between two things, the familiar source idea and something in need of resolution, which may usefully be thought of in terms of the source idea (Leatherdale, 1974). Thus, as "theories", they help us to reduce our uncertainty about some aspect of our world, and so help us to deal with that world in a more effective and satisfying way. As "models" they achieve this result by making some connection to something already known to us. At the same time it should be emphasized that the basis of such analogies is always highly selective, involving only those features which interest us most, and ignoring those which do not.

Analogical models used in architectural design also work in just this way. The unknown thing in this case is the building to be designed, meaning the system of relations between all the different factors an architect must consider in creating a building. The system of relations which tells him, for example, what specific interpretation and value he should place on each factor in relation to all the rest.

From the point of view of the way analogical models serve as a practical guide to the architect, we can describe their function as *prescriptive*. They suggest to architects what to build and how to build. But as students and researchers, we can make use of these same models, once they have been identified, to explain why an architect designs a building the way he does, and not some other way. Used in this fashion, analogical models are *explanatory*. But what about the use of such models as *predictive* tools of the sort favoured by physical scientists? Well, if human beings behaved like deterministic machines, we might be able to predict with some precision the results of different approaches to design. But since they do not (though some famous architects once thought they did), the use of analogical models for this purpose is mostly restricted to problems of structure, use of energy, and similar quantifiables (Friedman *et al.*, 1978).

TYPES OF MODELS

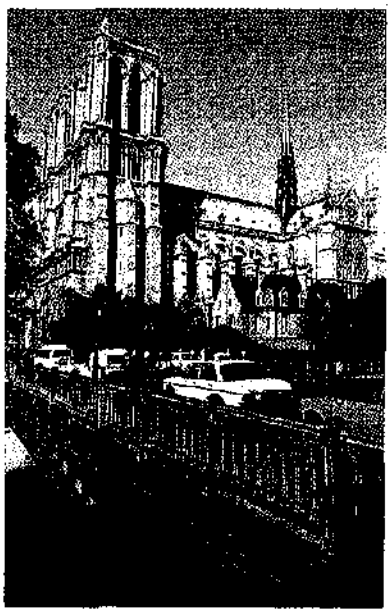
All the fifteen analogical models described below share the foregoing defining properties and functions. However, I have divided them into two groups, according to one important distinction. The first eleven models have all been demonstrated by their actual use by architects to provide direct and powerful sources of *formal imagery*. The particular metaphor or set of metaphors involved therefore have this distinctive quality as sources of visual and spatial inspiration.

Most also share certain qualities as near timeless sources of inspiration. Their very persistence, sometimes over several millennia, not only testifies to their deep roots in enduring myths and perhaps universal themes, but also to the creative potential involved in the metaphorical process. The resultant historical perspective is therefore very different from the familiar sequential "progression" from one architectural development to the next. This latter kind of architectural history can be very misleading, in that it obscures the recycling and continuity of architectural ideas, while the present approach emphasizes these aspects.

The last four models, though also analogical in nature, refer to different kinds of metaphors, which all have to do with *processes* of one sort or another. None of these models leads directly in any meaningful sense to a specific or concrete conception of the form of a building. They do of course influence an architect's approach in such a way that, indirectly, he is inspired to design a building one way rather than another. But the power of the other models to invoke a tangible conception of what a building should look like, remains an important

distinguishing characteristic. Further, the distinction points to a recent theoretical and educational development, namely an increasing awareness of the significance of "process" in architectural and urban design, an issue we shall return to in conclusion.

It should be emphasized that while some of these models are mutually exclusive, that is, they express opposite values, other models may, and have been frequently used in combination with each other. For example, the work of Le Corbusier is mentioned several times, not only because of his towering status as a twentieth century architect, but because he successfully made use of different theoretical models. Thus his work may be variously interpreted according to the Classical, Mechanical and Artistic models, depending upon which phase or aspect of his architecture the interpreter is most concerned with. More generally, the Organic model overlaps in some respects with the Identity model, the Utopian model overlaps with the Classical model, and even, during one period, with the Military model, and so on. Even process models may sometimes be used in combination with the more visually oriented models. For example, the Systems model lends support to the ecological concerns of architects favouring the Organic model, and the Linguistic and Identity models are now influenced by the Semiotic model.



Figures 4, 5. Exterior and interior of *Notre Dame Cathedral*, Paris (photographs by author)

It may also be noted that a common theme can be seen running through some models, which revolves around the opposition between *rational* and *romantic* attitudes toward architecture, and life in general. The former emphasizes the virtues of pure reason, and takes the achievements of scientists as an example which should be imitated in all other fields, leading eventually to forms of society governed by pure reason, and therefore supposedly universal. This attitude tends to result in "international" forms of architecture. The latter attitude emphasizes the so-called irrational aspects of human behaviour, favouring the more casual, organic forms of growth and change against the perfect forms produced by pure reason. Differences between cultures are expressed, rather than rejected, and human diversity appreciated as a source of inspiration, rather than the more abstract speculations of the mind. Though these two approaches may seem to differ so much, history suggests they are both necessary to human development, and complement each other as two sides of the same coin.

Finally, in drawing up the following list, special acknowledgement is due to Peter Collins (1965), for his *Changing Ideals in Modern Architecture*. The main reason for the differences in Collins ' shorter list of analogical models and my own more inclusive one is that I accord a far wider significance to the metaphorical process in all architectural development. This wider significance derives in turn from the general theory of creativity employed here, and detailed in my previous writings (Abel, 1980b; 1982b).

FORMAL ANALOGIES

THE SPIRITUAL MODEL

This model is historically the oldest, and has its roots in the most profound human beliefs. As William Lethaby (1974) explains in his *Architecture, Mysticism and Myth*, it is with the design of religious buildings that man symbolizes his relation to the cosmic order.

How an architect interprets this model therefore depends upon his specific religious beliefs. For example, Christians stand in awe and fear of God as the supreme authority, and Gothic cathedrals express this sense of wonder at the power of God and the consequent humbleness of man. This is mainly achieved by the skillful handling of the natural light inside the building and the soaring vertical interior spaces which lead the eye, and the "spirit", upward.

The characteristic transparency of the Gothic cathedral was made possible by separating the supporting structure of external buttresses from the space enclosing walls. In this way, the walls, since they bore little load, could be opened up

Figure 6. Outline of *Mont St. Michel* expresses perfectly the dominant position of the church as well as the compact form of the fortified medieval town (photograph by author)

with great windows which allowed natural light to flood the interior. The richly coloured patterns of stained glass which filled those windows and which are such a familiar feature of these cathedrals lent a further mystical quality to the light, which always beamed down "from above", since the largest windows were mounted very high. As Christian Norberg-Schulz (1974) describes it: "In the cathedrals coloured glass transformed natural light into a mysterious medium which seemed to prove the immediate presence of God".

Though the Spiritual model mostly relates to the design of places of worship, it may also determine the relation of those buildings to others in the surrounding settlement pattern. In this way, Gothic cathedrals typically dominate the medieval towns in which they stand, but through their transparent frames, affect a penetration between outside and inside which seems to draw in the surrounding community "into the arms of God" (Norberg-Schulz, 1974).

THE CLASSICAL MODEL

When we say that an architect in the West uses the Classical model as the basis for his theory of architecture, it usually means that he looks back in history to the architecture of ancient Greece and Rome as his main source of inspiration. He is generally so motivated on the assumption that ancient Greek and Roman civilization represents a pinnacle of Western cultural achievement, and so should be regarded as an ideal to be learnt from and imitated in the present less perfect world. Another aspect of the model, especially during the European Renaissance, is that whereas the Spiritual model is "God-centered", the Classical model is "man-centered". The following definition of classicism is from Michael Greenhalgh's (1978) *The Classical Tradition in Art:*

> Its concern is always with the ideal, in form as well as in content. Such is the case, it is true, with virtually all artists before Romanticism, but classical artists looked back to the ideal of Antiquity as well as to its varied styles. They were sure that art is governed by rules which are determined by reason. Beauty, which is one form of truth, must depend on some system of measurement and proportion, as Plato explained in the *Timaeus;* artists working from classical models made it their business to rediscover such a system in the works of art and buildings of Antiquity. Such an emphasis on measurement, allied to reason, is summarized in the Vitruvian figure of a man within a circle and a square, which expresses the concurrence between beauty, mathematics and Man. For the Renaissance artist, Man within the circle of God, is the measure of all things, and he rules himself and his affairs by the application of reason.

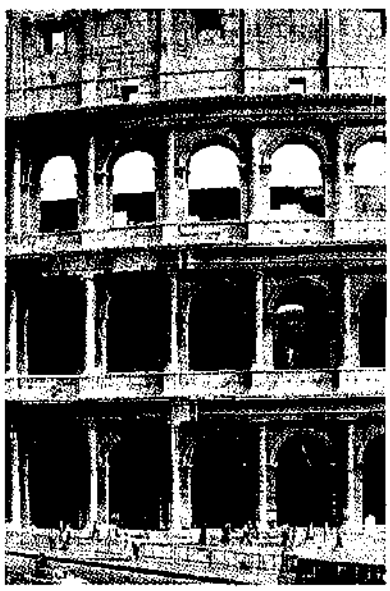


Figure 7. Stacked pilasters on the exterior of the *Colosseum*, Rome, provided Renaissance architects with a main source of ideas for designing the facades of their buildings (photograph by author)

8. Andrea Palladio's *Villa Rotunda* (1552) near Vicenza is partly modelled on the Pantheon in Rome and is itself the model for many other later buildings, including Lord Burlington's *Chiswick House* near London and Colin Cambell's *Mereworth Castle*, Kent (photograph by author)

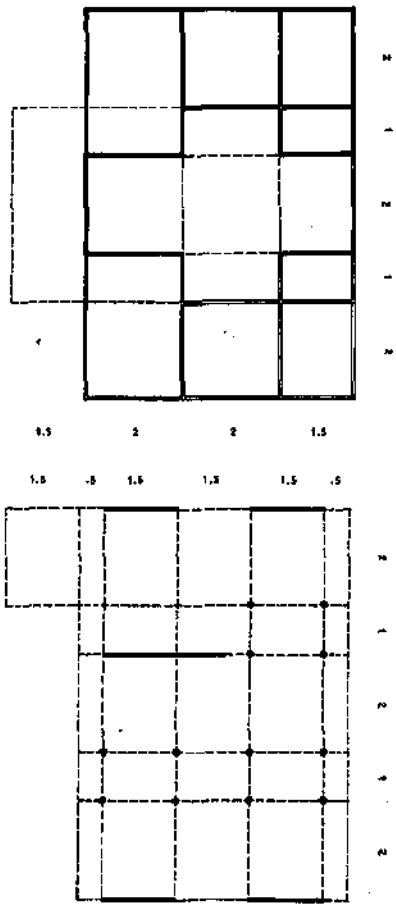


Figure 9. Analytical diagrams by Colin Rowe comparing the plan of Palladio's *Villa Malcontenta* (top) with that of Le Corbusier's house at Garches (bottom) (Rowe, 1976, 5)

The classical forms used by architects are mostly based on Roman rather than Greek models. This is mainly because Roman architecture, which was itself based on earlier Greek models, was much more varied and therefore offered a greater range of possibilities for use by architects of a later age. For example, whereas Greek architects only used columns as free standing elements of support, the Romans, beginning with the Colosseum, used them as surface elements in walls, a device much used by Renaissance architects. The Romans also created new building types, such as the public baths, which focused attention for the first time on the architectural treatment of interior space, as opposed to the plastic, external architecture of the Greek temples and other public buildings.

The Classical model is perhaps the strongest of all architects' historical influences and survived even the overt anti-historical tendencies of the early Modern Movement, though in a somewhat disguised form. As Colin Rowe (1976) showed in his seminal essay on "The mathematics of the ideal villa", for all their apparent "machine age" attributes, Le Corbusier's house at Garches and his *Villa Savoie* were also strongly influenced by the classical villas of Andrea Palladio. The plan of the house at Garches, for example, is based on similar proportional systems to that which shaped the plan of Palladio's Villa in Malcontenta, whilst the placement of the *Villa Savoie* in the open landscape exhibits the same balanced but contrasting relations with nature as governed the siting and design of Palladio's country villas (see the Organic model below for the classical idea of relating building to landscape). In similar fashion, Rowe's probing analyses exposed the Neo-Classical principles of pure geometry, universal space planning and post and beam structure underlying the later "pavilion" buildings of Mies van der Rohe. More recently, much of Norman Foster's architecture exhibits parallel tendencies. However, the efforts of Post-Modernists to recreate a contemporary Neo-Classicism have been considerably less subtle, resulting in an eclectic mish-mash of classical motifs, mostly thrown together with total disregard for authentic classical sensibilities of taste and proportion.

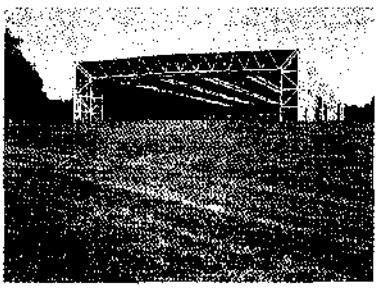


Figure 10. *The Sainsbury Centre for Visual Arts*, Norwich, England, by Norman Foster. The critic Bob Maxwell was so struck by the classical spirit of Foster's pavilion building with its open ended "porticos", that he likened it with the Parthenon. Compare also the building's setting in the landscape with Palladio's *Villa Rotunda* (Figure 8) (photograph donated to author by Foster Associates)

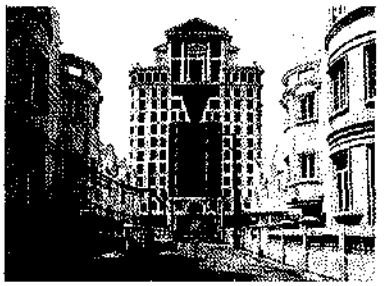


Figure 11. "Post-Modern" apartment block in Bangkok demonstrates the worst excesses of that movement. The "temple" on the roof is a penthouse (photograph by author)

THE MILITARY MODEL

Arising from the most elementary need for survival against hostile forces, the model of the fortified city, already well established in the plains cities of ancient Mesopotamia, is also amongst the oldest of all influences on the way man has shaped his urban environment (de la Croix, 1972; Hughes, 1976). As well as providing for defense, fortifications also became a source of civic pride, and especially during the most innovatory periods of contruction after the fifteenth century, were designed not without aesthetic sensibility. This was most apparent in the complete fusion of city and fortifications exemplified in the "ideal" radial city plans drawn up by Francesco di Giorgio Martini and other Renaissance designers (See the Utopian model below; Rosenau, 1972; Argan, 1969). The polygonal plans and radial streets were necessary to move heavy canon and troops from one threatened bastion to another across the shortest possible distance. But the star shaped city, with its pointed bastions, created a powerful image of a perfect, centralised order that appealed both to architects and their autocratic rulers. Uneven terrain prevented the construction of many such idealized systems of fortification, but Palmanova in Italy still exists as an uncompromising demonstration of the form.

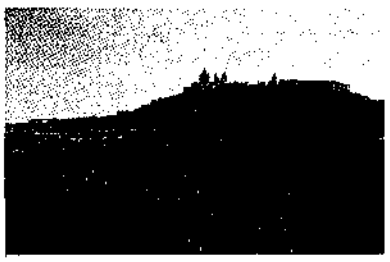
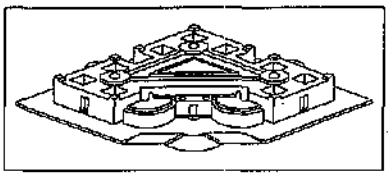


Figure 12. The fortified city of Mdina, Malta, still preserves its compact image on the skyline (photograph by author)

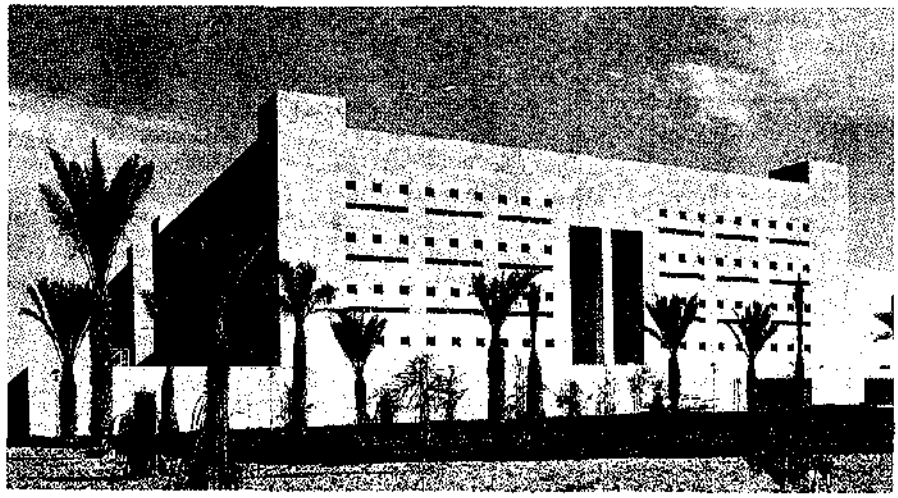


Fiure 13. Henning Larsen's design for the Ministry of Foreign Affairs, Riyadh, assimilates various regional building forms, including desert fortresses and inward-looking courtyard dwellings. The plan was also strongly influenced by the plan of the Taj Mahal (photograph donated to author by Henning Larsen).

But the most effective influence of the model on the sensibilities of contemporary architects and urban designers has been in the clear cut image the fortified city presents of a distinctive urban and civic entity. This compact, man-made mass, dramatic on the skyline, by necessity turning in on itself from the surrounding countryside as a source of possible threat, still appeals to those who cannot abide the urban and suburban sprawl afflicting modern cities, and the dissolution of urban form and civic life that comes with it.

Aside from its continuing value as an image of urban form, the model was given a new twist in Oscar Newman's book, *Defensible Space*(1972). In a still insecure world, the source of threat now comes, not only from external forces, whose nuclear weapons now render whole populations virtually defenseless, but also from the enemy within. In many Western cities, especially in North America, urban crime has reached such levels that the architect and urban designer now need to focus on the neighborhood and individual home as the unit of fortification. More conventionally, the model also surfaces from time to time as an architectural metaphor (see the Linguistic model below) in the design of major building projects, such as the Richards Laboratories in Philadelphia by Louis Kahn and the Ministry of Foreign Affairs in Riyadh by Henning Larsen (Abel, 1985).

Figure 14. Fortress-like exterior of the MOFA, Riyadh (photograph by author)



THE UTOPIAN MODEL

The word "utopia" comes from the famous book of the name by Thomas More (1949), who became Chancellor of England in the time of Henry VIII. In his book, More described in some detail the way of life and government of the people of an imaginary perfect society on the island of Utopia. Ever since, the word has come to refer to any imagined perfect society of the future, where all the ills and conflicts of the world would be resolved. Utopia therefore stands for a visionary concept of a better society than the one we have, and as such, in its most positive aspects, provides a goal against which to measure the present achievements of society (Hayden, 1976).

In architecture, the idea of Utopia appears in the recurrent attempts by architects to design the "ideal city", as defined here by Helen Rosenau (1972) in her book of the same name :

> ... an ideal city represents a religious vision, or a secular view, in which social consciousness of the needs of the population is allied with a harmonious conception of artistic unity. That an ideal plan, when executed, generates its own problems through changing circumstances hardly needs stressing, but its value remains unaffected as far as it is a projection of a perfect image, a vivid expression of optimistic faith; indeed, this is perhaps the most striking feature the ideal images have in common: they are based on a belief in betterment, either on this earth or in the hereafter.

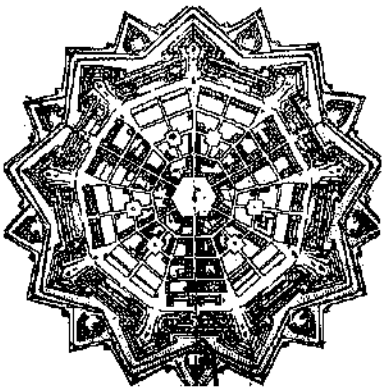


Figure 15. The plan for Palmanova, as built, by Cacogliattl, c.1695 (de la Croix, 1972)

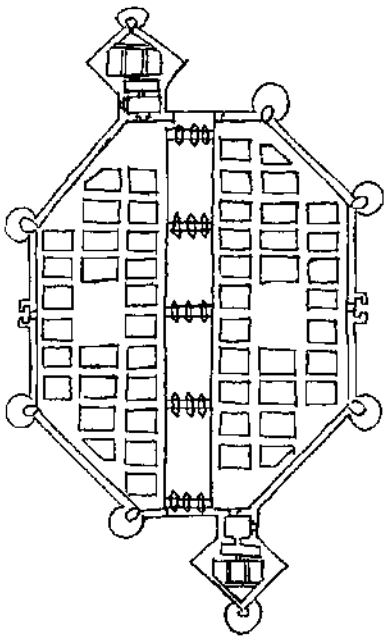


Figure 16. Project for an ideal city by Francesco di Giorgio Martini, c.1490 (Giedion, 1980, 153).

Figure 17. Le Corbusier's 1930 project for a *Ville Radieuse* exhibits similar obsessions with pure geometry to those which shaped earlier utopian schemes (Le Corbusier, 1927)

Figure 18. Mud-built courtyard dwellings in old quarter of Riyadh typify the organic model of indigenous architecture (photograph by author)

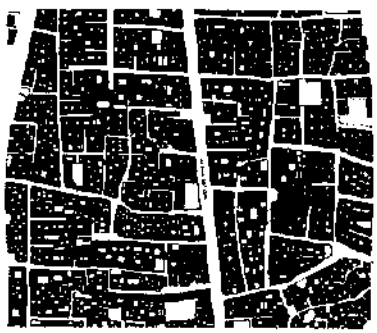
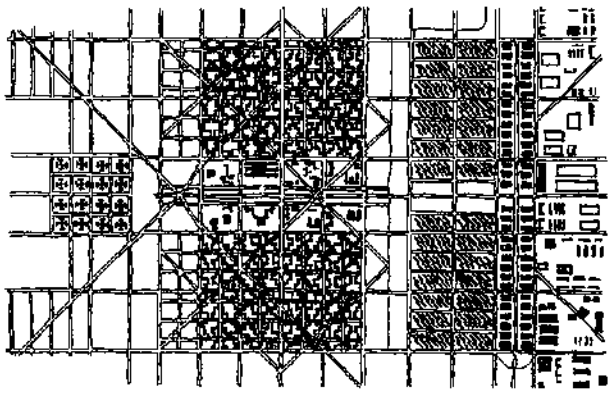


Figure 19. Plan showing the dense, "organic" pattern of indigenous courtyard dwellings, Riyadh. *Culs-de-sac* mark semi-private access while throughways mark public routes. The straight gash through the centre is a recent intrusion of modern movement systems (Al-Hathloul, 1981)

In some important respects, therefore, the Utopian model (as well as being influenced, as we have seen, by the Military model) is similar to the Classical model, in that both point to a conception of an ideal society as the basis for architectural inspiration. However, whereas the Classical model looks backward in history, the Utopian model looks forward to some future time, when the world in which we live will be different from anything we have known. We might say that in this respect the Utopian model is progressive, while the Classical model is conservative. Nevertheless, despite this essential difference between the two models, Utopian architects have found in the classical forms of ancient cities a prototype for the ideal city of the future. This is not such a contradiction as it might at first seem. Like anyone else trying to imagine the unknown, utopian architects must rely at least in part on something they are already familiar with to form a suitable image, and the geometrically perfect forms of Antiquity seem to provide a suitable inspiration for a plan based on reason (geometry being a product of abstract reasoning).



THE ORGANIC MODEL

This model points to strong relations between a building and its natural environment (Zevi, 1950, 1978; Collins, 1965; Steadman, 1979). The idea borrows from Darwin's theory of the evolution of natural species, and the way each species is well-adapted to the climate and other plant and animal life in the local area (Darwin, 1972). This suggestion in turn leads to the second aspect, the fitness of form to function (Benton *et al.*, 1975), encapsulated in the well known phrase, "form follows function", attributed to Louis Sullivan. Organic forms, including the human body, are always well-adapted to purpose, such that, for example, all parts of the human body are integrated together by function in a unity of form. Likewise, as Frank Lloyd Wright suggests, all the parts of a building should be integrated into an organic whole (Wright, 1941).

Both of these prescriptions and the architectural ideas that follow from them seem to suggest quite different concerns from those which derive from the Utopian and Classical models, with their emphasis on the ideal, whether historical or imaginary, and the pursuit of universal forms applicable to all circumstances. The emphasis of organic architecture, by contrast, is on the particularity of forms, and their fitness to the specific character of places and ways of life. As we learn also from the Identity model, contemporary architects influenced by this model find much inspiration in the indigenous architecture of traditional cultures, where the relative absence of change permitted a complete adaptation of building form to the cultural environment as well as the natural ecology.

Forms of nature offer powerful sources of visual inspiration for architects, and frequently result in quite literal imitations. Perhaps the most obvious influence of natural forms is to be seen in the work of Antonio Gaudi, whose architecture seems almost to breath with life. Abstracted somewhat, but still very clear, are the tree forms with trunk and branches which appear in the apartment and

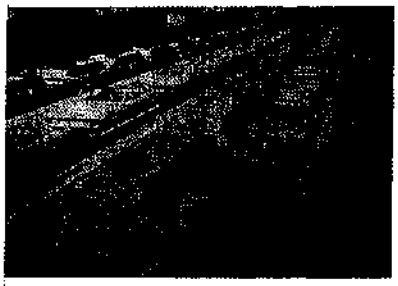


Figure 23. Architects have often looked to the mass-production of automobiles as a model for industrialized building (photograph donated to author by Ford Motor Corporation)

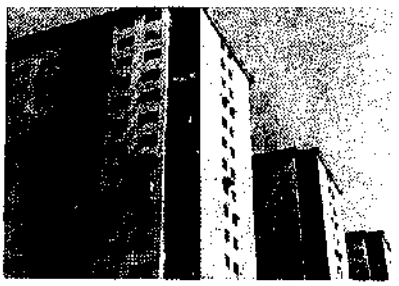


Figure 24. Industrialized high-rise housing on Penang Island, Malaysia, looks identical to similar projects around the world. The poor quality of most industrialized building systems was a major factor in negative public and professional perceptions of the Modern Movement (photograph by author)

Figure 26. *Centre Pompidou*, Paris, by Piano and Rogers, is the most complete realization of *avant-garde* projects of the 1960's for multi-purpose, advanced technology structures (photograph by author)

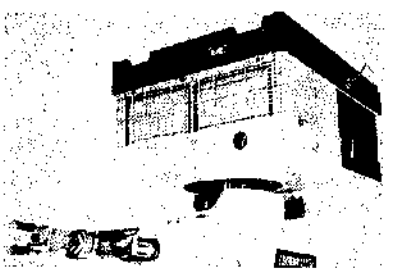


Figure 27. Programmable industrial robots, such as this Unimate model, reduce the need for standardization in industry, making it possible to design and produce customized components for single building projects (photograph donated to author by Unimate Industrial Robots Ltd)

28. Banking hall in the *Hong Kong Bank*, by Norman Foster, suggests both "second machine age" architecture and Gothic naves. For this reason, the Bank is often referred to as a "cathedral of commerce". The aluminium cladding was tailor-made from thousands of different components with the help of industrial robots (photograph donated to author by Foster Associates)

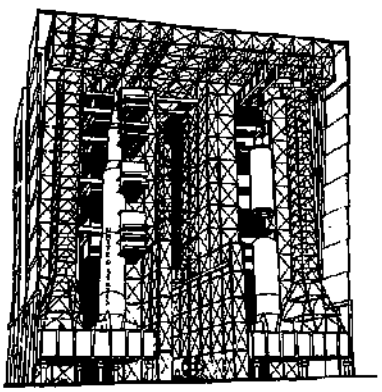


Figure 29. *Assembly Building for Saturn Rockets* Cape Kennedy, was a powerful source of ideas to Richard Rogers, Norman Foster and other architects wanting to make the most use of advanced technology and engineering (Cook, 1967,61)

produced by the same technologically advanced methods of production as were used to produce automobiles (Abel, 1979).

It later became clear from the fashion in which these revolutionary buildings were eventually constructed that the early Modernists were more concerned that a building should look like a machine, or that it had been built by one, than that they should be as functionally efficient. Nevertheless, the Mechanical model caught on with successive generations of architects, even up till the present day, in its contemporary form as "high tech" architecture. Innovations in highly flexible, or "cybernetic" methods of computer assisted manufacture (CAM) are also beginning to make an impact on the construction industry, and can be expected to cause many architects to revise their notions about the architectural potential of industrialized building (Abel, 1969; 1986a).

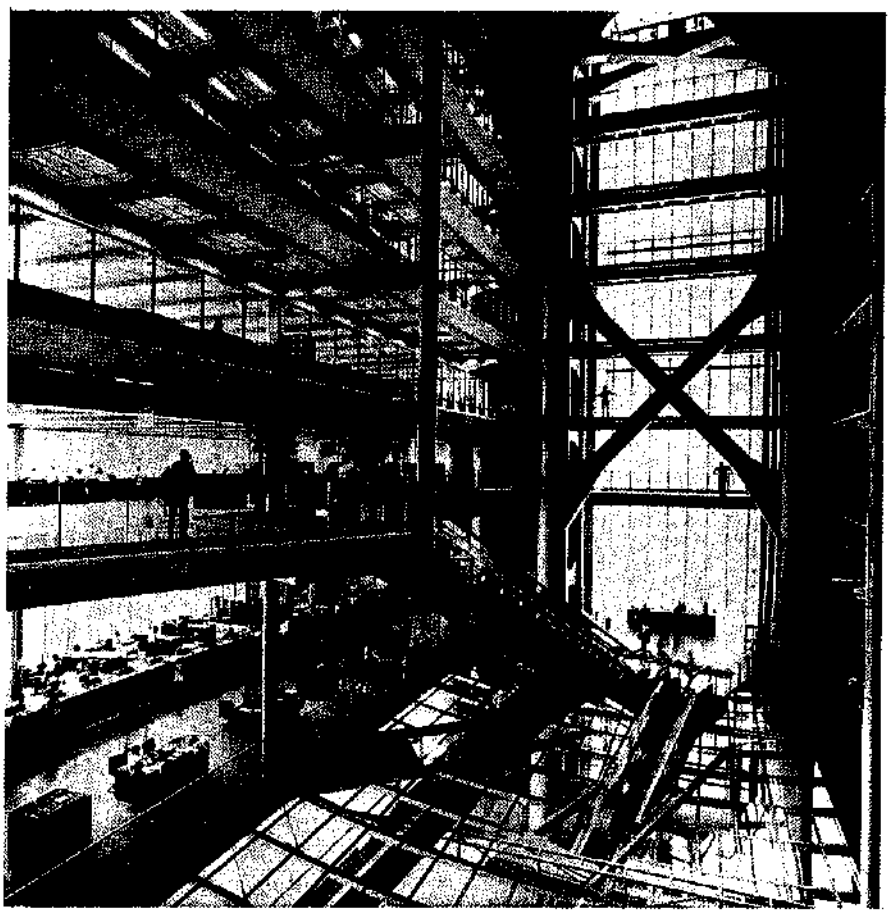


Figure 30: Cuzco, Peru, built by Spanish colonists. Consciously built in imitation of Spanish models, the picturesque town is typical of the medieval cities and towns Camillo Sitte held up as examplars of "the art" of urban planning and design (photograph by author)

THE ARTISTIC MODEL

The treatment of architecture as an art form has been encouraged by the fact that a few of the greatest architects were accomplished artists in other fields. Michelangelo was a sculptor and painter before he became an architect, and Le Corbusier's development as an architect mirrored his development as a painter and sculptor (Gardiner, 1975). Renaissance architects, even when they were not painters or sculptors themselves, sought to integrate these arts into their building designs, and often commissioned elaborate fresco paintings for interior walls and ceilings that sometimes dominated the interior architecture. This tradition is still kept up, though in a less integrated fashion, through the commissioning of abstract paintings and sculptures to complement the designs of modern buildings.

However, aside from these attempts to combine different forms of art in a building design, the most important influence of the model is in the treatment of the building forms themselves as visual compositions, much as a painting or sculpture is composed according to artistic principles of composition. For example, Camillo Sitte (1965), the Viennese architect and planner, wrote his book, *City Planning According to Artistic Principles*, in the belief that the most satisfactory urban forms were those designed for "picturesque" effect. From his studies of medieval towns in Europe, Sitte derived principles for the visual composition of buildings aimed at the creation of public open spaces and pleasing vistas (Collins and Collins).

A quite different kind of interest in the artistic model emerged in the early Modern Movement, when architects were much influenced by the new forms of abstract painting and sculpture then being produced by the *avant-garde*. For example, the painting of Mondrian was to acquire a special importance, especially amongst architects of the so-called *De Stijl* group, whose furniture and building designs as abstract compositions of lines and planes seemed to define a new concept of architecture as a pure art form, making painting and sculpture (according to some) redundant as separate forms of art (Collins, 1965).

The most creative recent exponent of this artistic conception of architecture was Le Corbusier, who, after breaking with his earlier preference for the machine aesthetic, developed a new kind of sculptural architecture. In one sense, Le Corbusier's appreciation for plastic form was nothing new for him, since he had always made clear his admiration for the plastic qualities of the ancient Greek temples. But it was not till his designs for the Chapel at Ronchamp and the public buildings at the new city of Chandigarh in India that he was able to give full expression to his abilities as an "architectural sculptor".

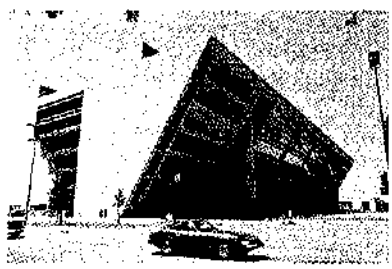
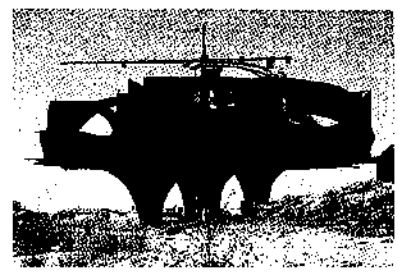


Figure 31. *City Hall*, Dallas, by I.M. Pei, is designed for maximum sculptural effects as a free-standing object (photograph by author)

Figure 32. House made of steel, near Lubbock, Texas, was designed and made by a professional sculptor for his own use (photograph by author)

Figure 33. Le Corbusier, *Pilgrimage Chapel of Notre Dame du Haut*, Ronchamps, 1955 (METU Archive). Sculptural appearance of District Town-Hall in Kuala Lumpur is influenced by le Corbusier's Ronchamp and other civic buildings in India (photographs by author)



THE LINGUISTIC MODEL

The idea that architecture is like a language, like the other models, is historically well confirmed (Summerson, 1963). But it acquired a new import with the emergence of Post-Modern architecture. This new movement is much concerned with issues of meaning in architecture (Jencks and Baird, 1969; Jencks, 1977). Post-Modernists criticise Modern architects for not taking responsibility for the meanings people attach to their buildings, and pretending that they are the

Figure 34. Bird-like shape of *TWA Terminal*, Kennnedy Airport, New York, by Eero Saarinen, provides a powerful and easily understood metaphor for flight (*Zodiac*, 54)

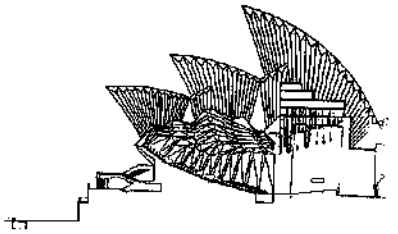


Figure 35. Sail-like roof forms of the *Opera House*, Sydney, by Jorn Utzon, were inspired by the building's prominent site in Sydney harbour (Gledion, 1980, 680).

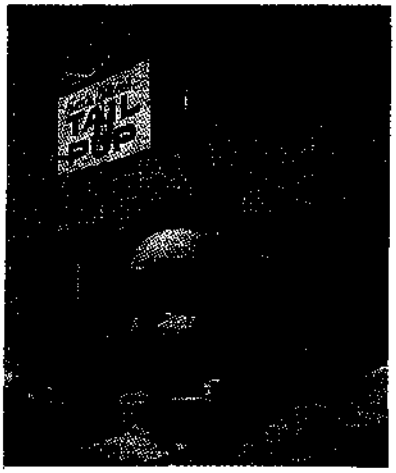


Figure 36. Hot-dog stand, Los Angeles, communicates its purpose in a direct and amusing fashion (photograph by author)

Figure 37. The *Strip*, Las Vegas, presents a brilliant kaleidoscope of messages oriented exclusively to the mobile consumer and fun-seeker (photograph by author)

inevitable result of historical process. As we are now aware, ordinary people never liked the cool white, machine aesthetic preferred by the early Modernists, and when they had the choice, rejected the Modernists' mass-produced apartment blocks for more familiar and comfortable kinds of homes (Brolin, 1976).

So now Post-Modernists say that architecture should communicate more to the users of buildings. Since human language is the most familiar form of human communication, architects look to language to try to learn how to create an architecture that people understand and appreciate. But what they learn from this analogy depends very much on their understanding of how human language works, and since there is quite a bit of disagreement amongst even specialists in human language, we can expect architects also to be confused.

For example, many architects have a very simple idea about language, and think that people can "read" a building the way we read the words on a page. So single building elements are likened to words and the rules governing their composition are likened to rules of grammar. We read the meaning of a church therefore, by noting the church tower or altar, and its placement in the whole building arrangement. The idea that building forms should be treated like very obvious metaphors is a variant of this approach and has produced some amusing and spectacular architecture (Abel, 1982b). For example, Eero Saarinen designed the TWA passenger terminal at New York airport to resemble a bird in flight, and Jorn Utzon designed the Sydney Opera House to resemble the sails of a yacht in Sydney's famous harbour. These are among some of the more literal interpretations of the idea that architecture should "say something".

But these sorts of interpretations of the Linguistic model miss out the deeper functions of human language, and which relate with the Identity model (Abel, 1980b; 1981a). Every person knows how much of his own identity is tied up with his national language. In this sense, language is more than just a form of communication, it provides a framework for social experience. This is a complex idea, but if properly understood by architects, might encourage them away from the free and flippant use of architectural "quotations", in the direction of more serious and consistent forms of architecture conducive to cultural identities. And just as there are regional dialects of language, so would we expect there to be regional variations in architectural "languages".

THE COMMERCIAL MODEL

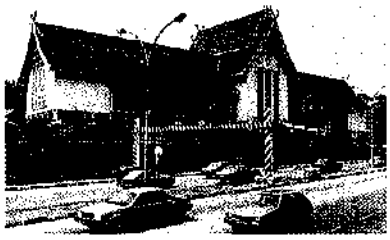
The use of this model arises out of a total rejection of the European tradition of architecture and city planning as the manipulation of internal and external spaces. Its best known exponent, the American architect and theorist, Robert Venturi (1966; 1972), argues that this space-oriented conception of architectural and urban form has been overtaken and outdated by new forms of dispersed urban development made possible by the universal use of the motor car and telephone (Clay, 1973).

The spatial character of the traditional European city to which Venturi refers is exemplified by the enclosed space of the Italian *piazza* , or public square. By contrast, the typical American pattern of urban development is the exact reverse in terms of spatial quality. Buildings stand in spatial isolation from each other, laid out in seemingly endless gridlike patterns of roadways which reduce the sharp distinction between city and country typical of the more compact European model. Dwellings are single family units, each with its own garden and garage for the essential automobile, making up the popular "suburban" residential areas which now surround even most older cities in other parts of the world. In order to be close to the customers, the " down-town" commercial centers of older cities are increasingly displaced by "out-of-town" shopping centers and other commercial outlets, usually strung along the main highways like beads on a string. Appreciation of building form and urban space in this situation, argues Venturi, is irrelevant, because different criteria apply. The slow moving viewpoint of the pedestrian is no longer of any consequence, because all human movement is now by the fast-moving automobile.

Figure 38. Suburban metropolis in Nassau County, Long Island. Much of this area was developed after 1945 and is based on almost universal car ownership.

Figure 39. The design of some signs in Las Vegas achieves "pop-art" (photograph by author)

Figure 40. Drive-in restaurant, Los Angeles. Mobile consumers park alongside a menu stand outside the restaurant and place their order by phone, which is then brought out to them by a waiter and consumed in the car (photograph by author)



Figures 41, 42. *National Museum*, Kuala Lumpur (below) is designed in imitation of Malay indigenous architecture (above) so as to project an image of cultural identity (photographs by author)

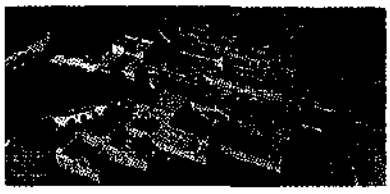


Figure 43. The Aga Khan University and Hospital complex, Karachi, by Payette Associates, was designed after extensive research into Islamic architecture and combines traditional planning principles with modern building forms (photograph donated to author by The Aga Khan Award for Architecture)

In order to design buildings for this new, mobile society, Venturi suggests that architects should give up looking for guidance to the European model of the "spatial city", and look instead at those commercial building forms which have emerged (without the benefit of professional architects) out of a direct response to the commercial requirements of the "non-spatial", dispersed, automobile-oriented city. This "commercial vernacular" is best exemplified, according to Venturi (who disclaims the implied values) by the buildings of Las Vegas, a gambling and entertainment resort city in the state of Nevada.

THE IDENTITY MODEL

This model has its roots in a reaction against the worship of science and pure reason, which came to its first peak in the Age of Enlightenment of the eighteenth century. The Romantics, as artists and intellectuals such as Johann Gottfried Herder (1744-1803) were called, sought an alternative to the universal culture forms assumed to be in keeping with a rational society, and emphasized instead the unique attributes of different regional cultures (Brolin, 1976, Abel, 1981b).

The new respect for regional forms of culture led architects to look upon traditional or indigenous building forms as appropriate models for imitation. Like organic forms of life, they appeared to architects to grow directly out of the regional environment. This was recognised by Frank Lloyd Wright, who brought Romantic values into the Modern Movement in architecture, and saw in the "folk architecture" of Italian hill towns and the like, an inspiration for an authentic American architecture, also founded on organic principles, and springing from regional resources (Wright, 1941).

Most recently, the search for "regional architecture" has become intensified with the rejection of the standardised forms of orthodox Modern architecture, and the suppressive effect such forms have had on local building and urban traditions. Thus many contemporary architects now try, with varying degrees of success, to borrow from local traditions to create an architecture which relates to the past, as well as to present demands. One outcome of this redirection is an increasing tendency to preserve or adapt existing building of historical value, rather than tearing it down to make way for the new, and also to blend new buildings in with the old in more sensitive ways (Insall, 1972; Brolin, 1980; Abel, 1986b).

At another level, Norberg-Schulz (1974; 1980) draws upon existential philosophy to explain man's need to identify with his environment. For Norberg-Schulz, architecture is equivalent to the philosopher Martin Heidegger's concept of "dwelling", which may be understood as an active process of human engagement with the earthly landscape. Thus, as Norberg-Schulz puts it, the very idea of what it is to be human being is tied up with the idea of "dwelling": "Human identity presupposes the identity of place" (Norberg-Schulz, 1980).

Other writers emphasize the importance of being able to interact in a personal way with architecture, most of all in the home, in order to allow proper expression of the personalities and social status of the occupants. In this case the focus upon the relations of identity between home and occupant provides the common theme. Some argue for "open-ended" design in housing to permit users to take an active role in the design of their homes. Here the Identity model overlaps with the Self-Build model (see below). For example, Turner (1976) argues that self-built housing provides a means of meeting not only the practical

44. *Diplomatic Club*, Riyadh, Saudi Arabia, by Omrania and Frei Otto, conjures up regional images of desert tents and fortresses and blends in perfectly with the surrounding landscape (photograph donated to author by the Aga Khan Award for Architecture)

Figure 45. Redevelopment of the *Hafsia Quarter* in the Medina or old town of Tunis, won an Aga Khan Award for Architecture for its regional character and sensitivity to context (photograph by author)

Figure 46. Self-built housing on Penang Island, Malaysia (photograph by author)

Figure 47. Basic shelters built from reed mats on the outskirts of Lima, Peru (photograph by author)

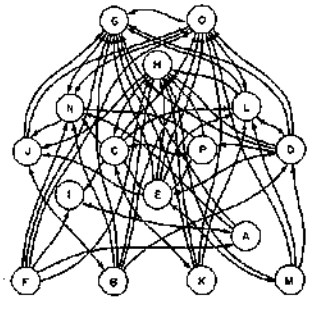


Figure 48. "Cognitive profile" elicited by the implication grid method in a pilot study carried out by the author with the help of students at Portsmouth Polytechnic (Abel, 1975b). The method requires that the subject states whether or not changes along one construct dimension imply an effect on any other construct in the subject's system. In the graph, constructs (nodes) are ordered vertically according to the number of links (arcs) implied by other constructs. The greater the number of implications the more important the construct, and, according to Hinkle (1966), the more resistant to change. The strong hierarchy evident in this particular profile suggests a comparatively rigid mentality.

need for low cost shelter, but equally important, the need for the expression of personal and social identity, which comes from having control over one's home and neighborhood.

THE SELF-BUILD MODEL

In some respects, this model also belongs in the process category, since, as will be clear, the idea of self-help behind it is a very broad one, and concerned as much with means as with ends. Yet the architectural implications are so immediate, that it has little in common with the abstract preoccupations that typify the use of the process models that follow, and is therefore included in the formal category.

It might also be argued that this model, though the least used by professional architects, is the most important of all our models, certainly for the poor people of the world. It has been estimated that some 800 million people in developing countries lack adequate basic shelter. By the end of this century, that number will increase by 1000 million, most of whom will live on the edges of the already swollen major cities of the Third World.

It is difficult even to imagine the scale of this problem of the world's homeless, let alone find solutions. Clearly, there can be little hope of any real change in this growing human tragedy without enormous economic aid to those countries with the worst housing problems, who are too poor to find solutions entirely on their own. Nevertheless, a great deal can be done in making the most of the initiative and desire of the disadvantaged to help themselves. This idea of "self-help" is the basis for the Self-Build model, which is one aspect of a broader effort on the part of poor people to make the best of their own limited resources, where government aid is not available. As Peter Ward (1982) explains in his critique of the model, the idea of self-help goes beyond problems of housing:

> It refers also to employment, welfare, churches, medical services and infrastructure. Self-help may involve individual as well as group inputs and corresponds to a system of production, financing, and maintenance in which a significant part is organised and carried out by the person or group. Usually it involves them in an incursion into functions that would normally be the responsibility of either the public or private sectors, who are either unable, or *unwilling* to provide that service. Only occasionally does self-help result from a genuine act of love or wish on the part of the individual or group to build their own house.

Though we may therefore find cases, in the U.S.A. for example, where the idea of building your own home is motivated by a creative impulse as well as considerations of cost (Kern, 1972), for most people the motivation is sheer necessity. Unless poor people build their own homes, they will not otherwise have any homes at all.

PROCESS ANALOGIES

THE SCIENTIFIC MODEL

As we have seen, Modern architects have been much influenced by the achievements of science to produce a "rational" architecture, in keeping with the scientific spirit of the times. Such an architecture was not only intended to make use of the most advanced technologies, but more importantly, was to be based on the same kind of general laws that scientists sought to explain both natural and human phenomena. Since, in the early part of the twentieth century, both physical and human scientists based their theories on a mechanical, or deterministic model of the universe, so also did architects believe that the relations between society and architecture were deterministic. By changing one, therefore, change could be effected in the other. Thus the coming of the "good society" could be hastened by building the new (scientific) architecture, which in any case was an inevitable part of the same historical process.

More recently, the influence of science upon architecture has taken a more direct turn. Increasingly, architectural teachers and researchers are looking to the theories and methods of scientists to help them both explain the nature of architecture and improve its quality. These efforts are divided between the evaluation of the physical performance of buildings in regard to energy use, *etc.* (Friedman *et al.*, 1978), and exploration of the behavioural relations between people and buildings (Rapoport, 1969; 1977). The latter area is by far the more problematic, and till recently the results were slim, largely due to the continuing influence of mechanical models of behaviour upon both human scientists, and now "environmental psychologists", as the new breed of researchers like to be called.

However, recent changes in basic theories of human behaviour (Kelly, 1963; Blumer, 1969; Giddens, 1976) have led to consequent improvements in both the theories and methods adopted in the environmental sciences. Much of the newer work in environmental psychology now focuses on how people interpret their environment, rather than merely respond (in mechanical fashion) to it (Proshansky, *et al.*, 1976; Broadbent *et al.*, 1980b; Abel, 1984). Aside from encouraging a greater sentivity to the varied interpretations of different users

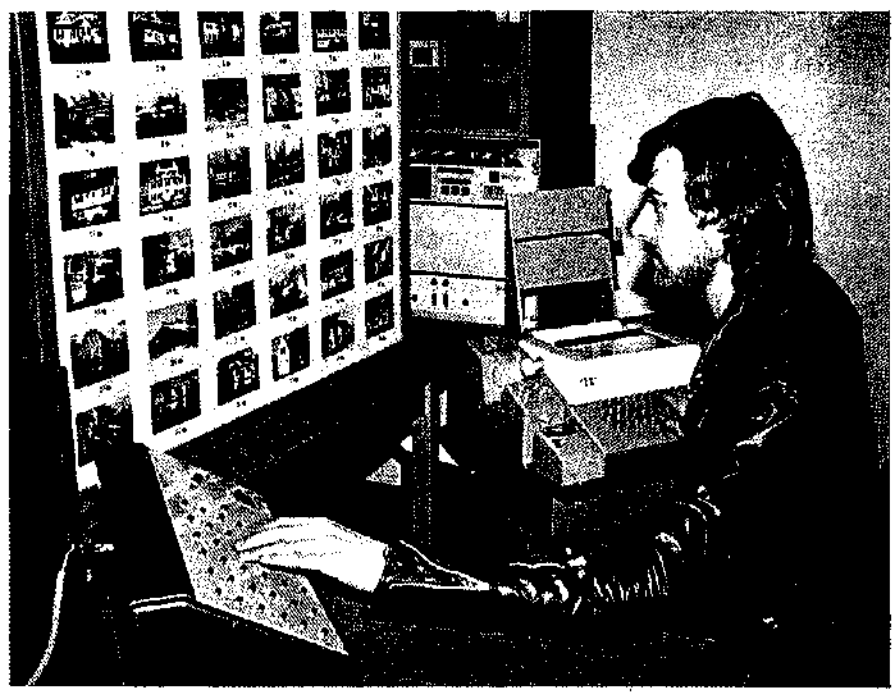


Figure 49. *Architrainer*, an experiment in computer-aided instruction (CAI) devised by the author, makes use of techniques derived from George Kelly's personal construct psychology (Kelly, 1955) as well as CAI to improve communication and understanding between architects and their clients. Kelly defines a construct as a pair of bi-polar concepts, ie., "modern-traditional", which between them establish a way of differentiating between relevant subjects of interest. According to Kelly, an individual is unique by virtue of the way he uses a particular range of constructs to structure his perception of a given topic. He devised a methodology, "repertory grid technique", to elicit an individual's "personal construct system". *Architrainer* consists of an interactive computer programme which includes a "client model" based on a subject's personal construct system and a linked display board showing the array of colour photographs of buildings (eg., houses of varying styles) used to elicit the uses a construct to differentiate amongst one group of buildings and then invites him or her to empathize with the client and guess how he perceives a different group of buildings (Abel, 1975a)(photograph by author)

of buildings (which often differ from architects' interpretations), it has also served to generate new insights into how people identify with their surroundings. For example, Kevin Lynch (1970) brought scientific theory and method to bear on studies of the relations between the formal characteristics of cities and problems of human orientation. Lynch's pioneering studies of the mental images people had of the cities in which they lived, spawned a whole new subject called "cognitive mapping" (Downs and Stea, 1977). The significance now attached to the concept of "place identity" as the interrelation of cognitive processes, social activity and formal attributes of the built and natural landscape is one of the more important results of this research (Canter, 1977).

THE SYSTEMS MODEL

This model originates in the efforts of scientists, notably Ludwig von Bertallanfy (1968), to unify the different branches of science by a common framework of ideas of great generality. The term "system" itself denotes a concern with the abstract relations between some combination of elements, be they human beings or microscopic cells, rather than with the specific character of those elements. The outcome, General System Theory, proved so successful, not only in this aim, but also in generating new insights into other fields, including architecture and planning (Ferguson, 1975), that though it is a direct product of scientific thought, it deserves consideration on its own as a relatively new model.

In addition to its scientific origins, many of the key ideas of G.S.T. derive in turn from analogies between the behaviour of human systems and organic phenomena. For example, systems theorists are much interested in the elusive qualities of wholeness which we recognise easily enough both in organic systems and the well-organised and purposeful behaviour of an effective social system, but, as laymen, are hard put to explain. It is the aim of the systems theorist to elucidate the underlying processes of "self-regulation" which generate and sustain this "holistic" property, in human society as in nature (Emery, 1969).

An important new dimension in the concern with urban systems has been the increasing awareness of how easily ill considered urban growth and industrialization can upset natural ecologies, such as in the devastating effects of acid rain. This relatively recent awareness of the delicate balance between man-made and natural systems has spawned new approaches, sometimes called "eco-development", suggesting how human development should proceed in harmony with nature, rather than in opposition to it (McHarg, 1971; Meier, 1974; Bartelmus, 1986).

Also promising are architects' attempts to produce an "autonomous architecture", in which energy is derived only from local natural sources, and where waste is recycled to generate more energy (Vale, 1975). Thus knowledge at a more general level of how natural systems work lends powerful support to the use of the Organic model in architecture, not only as a source of visual inspiration, but also as an urgent matter of human survival.

It should be noted that the use of the word "system" in "system building" has little to do with the above ideas and concerns. On the contrary, it is apparent that most building systems are the outcome of too much concentration on the parts, or "components" of a building, and too little attention given to the quality of the whole (Russell, 1982). Better awareness of the potential of the advanced manufacturing processes mentioned above (Abel, 1969;1986a), as well as of the natural and cultural ecologies in which such buildings must be used, might help to improve their generally poor enviromental quality.

THE SEMIOTIC MODEL

The Semiotic model bears the same relation to the Linguistic and Identity models as the Systems model bears to the Organic model. Whereas the Linguistic model appeals to more direct images of what architects can or should "say" with their designs, the Semiotic model aims to reveal to us those more general processes of communication which underlie specific language forms and social identities.

Also, like General System Theory, from which it borrows some of its key ideas and methods, semiotics, or the "science of signs" as it is known, is interdisciplinary. It aims to provide ideas and methods applicable, not just to the study of human language, but also to all non-verbal forms of human communication, and even to the study of communication amongst animals. In this broader study, all the forms and products of human culture are treated as "signs", therefore stand for something to somebody, and enter into some form of communication by which human experience is structured, and made meaningful (Hawkes, 1977).

This emphasis on the structuring of experience is vital, since communications theorists used to think, and many architects still do, that language is something used to express already existing ideas, the two being somehow independent of each other. Yet most semioticians now acknowledge that the way we look at the world, and how we deal with it, depends on the language we use. Our perception of reality is, so to speak, built into our language, and, as Edward Sapir (1929) and Benjamin Lee Whorf (1956) put it, different languages embody different "worlds of reality".

In a similar way, buildings are also "signs", and enter into the process of structuring experience by the meanings they have for people (Bonta, 1979; Oliver, 1980). How we approach this difficult problem of the meaning of architecture depends, as already suggested, on the particular theory favoured. Most derive from the works of either Charles Pierce (1940) or Ferdinand de Saussure (1960), the founders of the new field. However, the approach most favoured here derives from Wittgenstein (1953), who suggested the deceptively simple phrase, "meaning is use". Thus the meaning of the word "Bishop" in a game of chess - a favourite analogy of his - lies in the uses to which the chesspiece is put, according to the rules of the game. This in turn implies that we can only understand the meaning of "Bishop" when we consider all the other chess pieces as well, and how the rules of the game allow each to be used in relation to all the others. Since, according to Wittgenstein, all human behaviour is rule-based (otherwise there could be no consistency of behaviour, and hence no shared meaning), the analogy extends to all forms of human meaning.

So it is that Wittgenstein directs our attention to the importance of the social context of meaning (Winch, 1958). Nothing is understood in isolation, but always with reference to its social purpose. In similar fashion, we comprehend the meaning of a building form according to how it is used, not just in terms of its immediate function, but also in the larger context of the social rules which govern its use. Thus we return to the key relations between architecture and social identity. For the conclusion to be drawn from this broader understanding of architecture as communication must be that architecture, like language, is not the simple product or expression of some independent social reality, but is one of the principal ways in which social reality is "encoded" (Abel, 1980a; 1980b; 1981a).

THE LEGAL MODEL

In the Semiotic model, reference has already been made to the rule-based character of human behaviour (Emmet, 1966). The legal model extends this conception in terms more familiar to the layperson.

Protection of neighbor's rights of privacy and access has been an established feature of law in some parts of the world for many centuries (Hakim, 1986). Today's sophisticated building bye-laws extend such protection of the public and individual (the purpose of all legal constraints) to ensure sound and safe construction. Aesthetic guidelines have also been enforced, at least since the building of Amsterdam, and are now commonly invoked to protect officially designated conservation areas and buildings of historical worth from undesirable change.

In such ways, the Legal model has clear prescriptive functions, affecting the direction and quality of architectural design. Nevertheless, unless a specific guideline is known, and in what architectural context it is to be followed, it is

not possible to derive a concrete image of form from the Legal model, in the same way that formal models invoke architectural images.

Other uses of the model also suggest that it belongs in the process category. These relate to its explanatory function in providing insights into the nature of architectural tradition. For example, it has been suggested by Collins (1971) and William Hubbard (1978) that the conventions of architecture may be likened to legal conventions, which are based on the importance of precedent in case law. Judgements made in any specific legal case are always made by reference to what judgements were previously passed in cases of the same type. Departures from precedent are possible, but usually only occur when it can be clearly demonstrated that circumstances, including public opinion, have changed so much that previous authority is no longer valid. Even so, such changes in the law usually involve a reinterpretation, or adaptation of existing conventions, rather than their outright rejection. In this manner, continuity and public understanding of the law is maintained, and by implication, continuity and security of social custom.

Such a model of slowly evolving conventions based on precedent has many attractions for those alienated by the revolutionary changes brought in by the Modernists. Though architects have neither clear obligation to follow precedent, or to set out their reasons for making specific decisions the way that judges have to, they are also normally heavily reliant on existing buildings of acknowledged merit, or "case studies", in order to learn how to resolve the many, often conflicting requirements with which they are faced. The other compelling reason for taking precedent seriously, is that, as in law, the authority of precedent ultimately derives from social acceptance. No matter what any individual judge may feel about the law or its application, he cannot change it arbitrarily, for to do so would be to put the support of the society at risk. That is just what architects also risk by arbitrarily rejecting historical precedent and previously sanctioned traditions.

SUMMARY AND DISCUSSION

A major problem facing both the architectural theorist and educator, concerns how and why it is that architects follow the design approach they use. As we have suggested, this problem hardly arises in traditional societies, where architectural customs are firmly established and rarely departed from, any more than other customs. But from the foregoing discussion, it will be evident that the use of theoretical models by definition involves an important element of innovation. Even when a dominant model is established, the analogical processes involved provide opportunity for seemingly endless variety in interpretation of the central metaphor (Abel, 1982b).

At one level then, we can say that the principal themes and values any significant model embodies have as their origin similar themes and values to be found in the myths and mores of the larger society. This is very clear in the 2500 year evolution of the Classical model in Western architecture, which still provides many contemporary architects with their main sources of inspiration. The specific historical and social context in which the model has emerged as a dominant force in architecture has changed almost beyond recognition in each of its main phases. Yet certain enduring obsessions in Western culture, having to do with the search for ideal forms, rationality, and geometric systems of proportion, have kept the model going. These themes, though much written about and discussed, also operate throughout Western culture in a mostly subliminal fashion, to shape the architect's predisposition toward a certain way of building. If it were not for such deep rooted cultural and mythic origins, no model could endure for long, or achieve the social legitimacy required to gain a firm hold upon the general public, as well as architects' imaginations.

LEARNING BY EXAMPLE

Nevertheless, the emergence of *architectural subcultures*, at least as early as ancient Greece and Rome, is an equally important social factor in understanding the historical evolution of each major model, and how it is that architects learn to use and manipulate such models. This arises primarily from the influence and power these subcultures have over the education and professional development of architects. More specifically, architectural subcultures are largely responsible for the selection and propagation of those key exemplars of a given form of architecture from which architects assimilate the underlying values involved, often without realizing it. For architects learn best by example, and acquire their understanding of both theory and method involved in reproducing a particular model by reference to how other architects made exceptionally good use of the same or similar theories and methods.

Though this is a time honoured method, and characterizes ancient systems of apprenticeship, as well as the studio teaching methods used in most contemporary schools of architecture, we should not regard it as outdated. Aside from the Legal model, the method is validated by other analogies. As Polanyi (1958; 1966) and Kuhn (1962; 1977) have shown, the use of precedent is essential for the assimilation of all complex forms of knowledge, even in the sciences, where we are led to believe the highest value is placed on explicit and abstract knowledge. Like scientific "paradigms", architectural traditions are established on the basis of repeated reference to the same key *historical exemplars*, only significant buildings rather than ground-breaking experiments. There is just no other way to absorb the complex and subtle concepts and rules of application involved in the use of any major theoretical model, other than by study of those better buildings which demonstrate how previous architects managed it well (Abel, 1981c). Neither does the use of precedent hinder creativity, as is often supposed, for as we have also learnt from the way analogical models function, all creativity involves a reworking of existing ideas and conventions. Rather than obstruct the creative process, convention is an essential prerequisite for creativity.

TENSION BETWEEN ARCHITECTURE AND SOCIETY

We can summarize the relations between an architectural subculture and other forms of society in the following way. These relations all revolve around the important concept of a building type, and its function in society. Building types are one way in which society encodes and reproduces itself. In effect, every conventional building type embodies a specific *social programme* which architects must fulfill in order to produce a functioning and useful building. The specific client's brief is therefore usually a more detailed version, with minor variations, of familiar requirements. To this task the architect brings with him his own *architectural programme*, embodied in the form of his preferred theoretical model. This too, has its origins in the larger society, but also in an architectural subculture, which has influenced the development of the model according to its own "internal" criteria.

To the architect who has a building to design, the building type is therefore usually a given, and already suggests most of the social functions to be specified in more detail by the architect and client. However, the architect's interpretation and treatment of those functions, and the ultimate form of the building, depends upon his or her theoretical model. We might equally say, it depends upon the architect's *style*. For the word style refers to those consistencies of approach and form we recognise when the same theoretical model is used in a similar way on different building types.

Thus the potential for "gaps" to emerge between an architect's particular interpretation and society's conventional programmes, derives from two main sources. First, it arises in an architectural subculture's influence on the development of the architect's theoretical model, which, though also culturally derived, is shaped in significant ways by the subculture's selection of key

exemplars of theory and method, even sometimes where these have not received social sanction. Second, it arises in the wide leeway for individual interpretation which all powerful analogical models seem to allow for, and even encourage.

Such gaps can be harmful, as we have seen in the emergence and rejection by Western society of orthodox Modern architecture. In this case, it was the specific interpretation early Modernists placed upon widely shared beliefs in the powers of science and technology that led them astray (even then, Modern architecture could never have had the impact it has had if its doctrines of total renewal and standardization did not accord very well with the concerns of at least some important sectors of society with a vested interest in large scale construction projects - namely government agencies, property developers and the construction industry). More typically, taking the longer historical view, architects have generally managed very well in maintaining an acceptable balance between respect for tradition and social acceptance, and creative interpretation of the social programme.

PRODUCT OR PROCESS?

At this point, it will already be apparent that the approach presented here to understanding how theoretical models work derives in part (there are other important philosophical sources mentioned in the introduction) from those same process models described above. In this way, process models, necessarily tempered by social and architectural history, fulfill a more general explanatory function, in so far as they are capable of offering explanations as to how any formal analogy is used by an architect to achieve both his immediate and cultural aims.

The emergence of these *superordinate models* as an influence on the course of architectural development is a relatively recent phenomenon in architectural history. As we noted, the early Modernists were also persuaded by the achievements of science to regard their own efforts as part of an historical process, and borrowed prevailing deterministic explanations of that process. But they remained architects first and foremost, still mostly concerned with the formal images they believed appropriate to a scientific age. This is still true of contemporary architects, their exposure to the highly abstract concerns of process models being usually confined to their student years. It is the professional academic researcher or critic who is most committed to the development and propagation of these models, since he is directly concerned with the explanation of architecture, whereas the practitioner is still most interested in the more tangible problems of what to build and how to build.

In an ideal world, we might therefore expect that the future architect assimilates both kinds of models, the formal models as direct sources of architectural tradition and inspiration, and the process models as sources of more general explanatory theory. However, what is happening now in many schools of architecture is something else. Since the careers of many teachers and researchers are now firmly bound up with studies of process models, in some schools such studies are now edging out the more traditional studies of formal models, to the point where the focus of study is no longer architecture, but the environmental or building "sciences".

If the aim of such schools were to produce professional scientists, then the trend would be acceptable. But they still graduate architects, and for this reason it is not. It is true that process models also provide powerful sources of integrating ideas, and are often presented as such by their advocates. But these ideas are of a different sort from the solid images derived from formal models, and operate at more abstract cognitive levels (formal models also involve processes of abstraction, as we have seen, but the properties abstracted are formal properties with direct architectural implications). Frequently, also, they are discussed without reference to any historical dimension, which severly limits their explanatory potential. Though, correctly used, process models can therefore

provide useful insights into the nature of architecture, and help to evaluate it, they can never displace formal models as the main sources of those integrating ideas essential to the *production* of architectural form.

The teaching of formal models is, as we have seen, generally achieved by reference to historical exemplars. By this means students assimilate the complexities of architectural design by process of immersion, not unlike the way we learn how to speak a language, to borrow a model again. Critical awareness is ensured by exposure to the alternative approaches embodied in different models, presenting, in effect, different worlds of architectural and social reality. Architectural teachers can put the explanatory theories they derive from study of process models to greatest purpose by using such knowledge to guide students efficiently through the most important sources of design ideas, which are real buildings of exemplary quality. And design researchers would do well to test their often highly esoteric notions of what the "design process" is, against some of the actual products of that process, the buildings themselves. In the final analysis, these are the main depositories of architectural wisdom.

MİMARLIK VE KENTSEL TASARIMDA BENZEŞİM MODELLERİ

ÖZET

Alındı : 31.10.1988;
Anahtar Sözcükler : Mimari Tasarım, Mimarlık Kuramları, Benzeşim Modelleri

Mimarlık.ve kentsel tasarım kuramı dersine giriş olarak 1984 yılında hazırlanan bu makale, "eleştirel görecelik" *(critical relativism)* ve benzetmeci *(metaphorical)* yaratıcılık kuramları konularında, yazarın daha önceki yazılarına dayanmaktadır.

Mimarlık konularının, alışılagelen şekilde bina tipi, teknoloji, estetik, gibi ayrı başlıklar altında incelenmesi, özelleşen bazı çalışmalar için yararlı olabilir. Ancak bu ne mimarlığın bütüncü *(holistic)* karakterini açıklayabilir, ne de öğrencilerin tasarlamalarına yardım eder. Gerekli olan, mimarlığın farklı yönlerini kaynaştırarak bütün haline getirecek "bütünleştirici fikirler"dir *(integrating ideas)*. Kuramsal modellerin sunduğu yorumsal çerçeve, mimarların tasarıma yaklaşımlarını tutarlı bir fikirler ve değerler sistemi olarak şekillendirmelerine yardım edecektir.

Bilimde de bütün kuramsal modeller, iki ayrı şey arasındaki benzetmeye *(analogies)* dayanır: tanıdık bir kavram (kaynak fikir) ve çözüm bekleyen şey. Böylece kuramlar, dünyamızın bir yönüyle ilgili belirsizlikleri azaltmaya, ve bu dünyayla ilişkimizi daha etkili bir hale getirmeye yardım eder. Modeller bizce bilinen birşeyle kurdukları ilinti yoluyla bu sonuca ulaşırlar.

Mimarlık ve kentsel tasarımda kullanılan benzetim modelleri aynen bu şekilde işlev görürler. Burada bilinmeyen, tasarlanacak bina, yani mimarın binayı yaratırken gözönüne alması gereken bütün değişik faktörler arasındaki ilişkiler sistemidir.

Mimara pratik bir yol gösterici olma niteliklerinden dolayı, benzetim modelleri, reçete gibi işlev görürler; diğer bir deyimle, mimarlara neyi, nasıl inşa etmeleri konularında fikir verirler. Bir kez tanımladıktan sonra, aynı modeller bir mimarın, bir binayı neden başka bir şekilde değil de yapmış olduğu şekilde tasarladığını açıklamada kullanılabilir. Bu kullanımlarıyla, benzetim modelleri, açıklayıcı olmaktadırlar.

Burada, onbeş değişik andırışsal model tanımlanmakta, tarihte ve yakın zamandaki kullanımlarıyla ilgili örnekler verilmektedir. Bunlar içinde belirgin iki ana tip vardır: mimarlara doğrudan biçimsel imgeler *(formal imagery)* sunanlar ve daha yaygınlıkla genellikle çok değişik süreçleri içerenler. İlk gruptaki onbir model: Tinsel Model; Klasik Model; Askeri Model; Utopik Model; Mekanik Model; Artistik Model; Dilbilimsel Model; Ticari Model; Kimlik *(identity)* Modeli; ve Kendin-Yap *(self-build)* Modeli; ikinci gruptakiler ise Bilimsel Model; Sistem Modeli; Anlambilimsel *(semiotic)* Model ve Yasal Model.

Sonuç bölümünde mimarların neden belirli bir model seçtikleri konusu tartışıldıktan sonra, belli örneklerin seçilmesi yoluyla tasarım bilgisinin transferinde, mimarlık alt-kültürlerinin rolü açıklanmaktadır. Mimarlık eğitiminde süreç modellerinin açıklayıcı değeri vurgulanırken, tasarım fikirlerinin oluşması için gerekli olan, daha geleneksel, biçimsel modellerin gözardı edilmemesi istenmektedir.

REFERENCES

ABEL, C. (1968) Evolutionary Planning, *Architectural Design* (38) 563-564.

ABEL, C. (1969) Ditching the Dinosaur Sanctuary, *Architectural Design* (39) 419-424.

ABEL, C. (1975a) "Instructional Simulation of Client Construct Systems", paper presented to the 1975 Architectural Psychology Conference, University of Sheffield.

ABEL, C. (1975b) "The Direct Elicitation of Construction Links", unpublished paper, Portsmouth Polytechnic School of Architecture.

ABEL, C. (1979) Meaning and Rationality in Design, *Design Studies* (1:2) 69-76. Also in, *Meaning and Behavior in the Built Environment, eds.* G.Broadbent, R.Bunt, T.Lorens (1980) John Wiley and Sons, New York.

ABEL, C. (1980) The Language Analogy in Architectural Theory and Criticism, *Architectural Association Quarterly* 39-47.

ABEL, C. (1981a) Architecture as Identity, *Semiotics 1980,* Proceedings of the 5th Annual Meeting of the Semiotic Society of America, *eds.* M.Herzfeld and M.Lenhart, Plenum Press, New York.

ABEL, C. (1981b) Vico and Herder: The Origins of Methodological Pluralism, *Design: Science: Method,* Proceedings of the 1980 Design Research Society Conference, *eds.* R.Jacques and J.A.Powell, Westbury House, Guildford.

ABEL, C. (1981c) Function of Tacit Knowing in Learning to Design, *Design Studies* (2:4) 209-214.

ABEL, C. (1982a) The Case for Anarchy in Design Research, *Changing Design, eds.* B.Evans, J.A.Powell and R.Talbot, John Wiley and Sons, New York.

ABEL, C. (1982b) The Role of Metaphor in Changing Architectural Concepts, *Changing Design, eds.* B.Evans, J.A.Powell, and R.Talbot, John Wiley and Sons, New York.

ABEL, C. (1984) "Some Comparisons Between Architecture and 'New Paradigm' Human Science as Culture-Forms", unpublished monograph.

ABEL, C. (1985) Larsen's Hybrid Masterpiece, *Architectural Review* (178:1061) 30-39.

ABEL, C. (1986a) Ditching the Dinosaur _Sanctuary: Seventeen years on, *CAD and Robotics in Architecture and Construction, eds.* C.Giraud *et al.*, Kogan Page.

ABEL, C. (1986b) Regional Transformation, *Architectural Review* (180:1077) 37-43.

ALEXANDER, C. (1964) *Notes on the Synthesis of Form,* Harvard University Press, Cambridge, Massachusetts.

AL-HATHLOUL, S.A. (1981) "Tradition, Continuity and Change in the Physical Environment: The Arab-Muslim City", unpublished Ph.D. Thesis, MIT, Cambridge, Massachusetts.

ARGAN, G.C. (1969) *The Renaissance City*, George Braziller, New York.

BANHAM, R. (1960) *Theory and Design in the First Machine Age*, The Architectural Press, London.

BARTELMUS, P. (1986) *Environment and Development*, Allen and Unwin, London.

BENEVOLO, L. (1971) *History of Modern Architecture*, V.2, Routledge and Kegan Paul, London.

BENTON, T., BENTON C., SHARP, D. (1975) *Form and Function*, The Open University Press, London.

BERLIN, I. (1976) *Vico and Herder*, Random House, New York.

BERTALANFFY, L.von (1969) *General System Theory*, George Braziller, New York.

BLUMER, H. (1969) *Symbolic Interactionism*, Prentice-Hall, Englewood Cliffs, New Jersey.

BONTA, J.P. (1979) *Architecture and Its Interpretation*, Rizzoli, New York.

BOUDON, P. (1972) *Lived-in Architecture*, MIT Press, Cambridge, Massachusetts.

BRIGGS, M.S. (1974) *The Architect in History*, Da Capo Press, New York

BROLIN, B.C. (1976) *The Failure of the Modern Movement*, Van Nostrand Reinhold, New York.

BROLIN, B.C. (1980) *Architecture in Context*, Van Nostrand Reinhold, New York.

BROADBENT, G., WARD, A. *eds.* (1969) *Design Methods in Architecture*, Lund Humphries, London.

BROADBENT, G. (1973) *Design in Architecture*, John Wiley and Sons, New York.

BROADBENT, G., BUNT, R., JENCKS, C. *eds.* (1980a) *Signs, Symbols and Architecture*, John Wiley and Sons, New York.

BROADBENT, G., BUNT, R., LORENS, T. *eds.*(1980b) *Meaning and Behavior in the Built Environment*, John Wiley and Sons, New York.

CANTER, D. (1977) *The Psychology of Place*, Architectural Press, London.

CASSIRER, E. (1955) *The Philosophy of Symbolic Forms*, Yale University Press, New Haven.

CLAY, G. (1973) *Close-up: How to Read the American City*, Pall Mall Press, London.

COLLINS, G.R., COLLINS, C.C. (1965) *Camillo Sitte and the Birth of Modern City Planning*, Random House, New York.

COLLINS, P. (1965) *Changing Ideals in Modern Architecture*, Faber and Faber, London.

COLLINS, P. (1971) *Architectural Judgement*, McGill-Queens University Press, Montreal

COOK, P. (1967) *Architecture: Action and Plan*, Studio Vista/Reinhold Art, London.

de la CROIX, H. (1972) *Military Considerations in City Planning : Fortifications*, George Braziller, New York.

DARWIN, C. (1972) *On the Origin of Species*, Atheneum, New York.

DOWNS, R., STEA, D. (1977) *Maps in Minds*, Harper and Row, New York.

EMERY, F.E. (1969) *Systems Thinking*, Penguin Books, Harmondsworth.

EMMET, D. (1966) *Rules, Roles and Relations*, Beacon Press, Boston.

EVENSON, N. (1969) *Le Corbusier : The Machine and the Grand Design*, George Braziller, New York.

FERGUSON, F. (1975) *Architecture, Cities and the Systems Approach*, George Braziller, New York.

FEYERABEND, P. (1975) *Against Method: Outline of an Anarchistic Theory of Knowledge*, NLB; Atlantic Highlands; Humanities Press, London.

FRASER, D. (1969) *Village Planning in the Primitive World*, George Braziller, New York.

FRIEDMANN, A., ZIMRING, C., ZUBE, E. (1978) *Environmental Design Evaluation*, Plenum Press, New York.

GADAMER, H.-G. (1976) *Philosophical Hermeneutics*, University of California Press, Berkeley.

GARDINER, S. (1975) *Le Corbusier*, Viking Press, New York.

GIDDENS, A. (1976) *New Rules of Sociological Method*, Basic Books, New York.

GIEDION, S. (1980) *Space, Time and Architecture*, Fifth edition, Harvard University Press, Cambridge, Massachusetts.

GREENHALGH, M. (1978) *The Classical Tradition in Art*, Duckworth.

HABERMAS, J. (1968) *Knowledge and Human Interests*, Beacon Press, Boston.

HAKIM, B.S. (1986) *Arabic - Islamic Cities (Building and Planning Principles)*, KPI, London.

HAWKES, T. (1977) *Structuralism and Semiotics*, Methuen and Co., London.

HAYDEN, D. (1976) *Seven American Utopias: The Architecture of Communitarian Socialism, 1970 - 1975*, MIT Press, Cambridge, Massachusetts.

HINKLE, D.N. (1966) "The Change of Personal Constructs from the Viewpoint of a Theory of Implications", unpublished Ph.D. Thesis, Ohio State University.

HITCHCOCK, H.R., JOHNSON, P. (1966) *The International Style*, W.W.Norton and Co., New York.

HUBBARD, W. (1978) *Complicity and Conviction*, MIT Press, Cambridge, Massachusetts.

HUGHES, O. (1976) *Fortress: Architecture and Military History in Malta*, Alec Tiranti, London.

INSALL, D. (1972) *The Care of Old Buildings Today*, The Architectural Press, London.

JENCKS, C. (1977) *The Language of Post-Modern Architecture*, Academy Editions, London.

JENCKS, C., BAIRD, G. *eds.* (1969) *Meaning in Architecture*, George Braziller, New York.

KELLY, G.A. (1963) *A Theory of Personality*, W.W. Norton and Co., New York.

KERN, K. (1972) *The Owner Built Home*, Charles Scribner's Sons, New York.

KOESTLER, A. (1964) *The Act of Creation*, Macmillan, New York.

KOSTOF, S. *ed.* (1977) *The Architect*, Oxford University Press, New York.

KUHN, T.S. (1962) *The Structure of Scientific Revolutions*, University of Chicago Press, Chicago.

KUHN, T.S. (1962) *The Essential Tension*, University of Chicago Press, Chicago.

LEATHERDALE, W.H. (1974) *The Role of Analogy, Model, and Metaphor in Science*, Elsevier, Amsterdam.

Le Carré Bleu (1965:1) Projet pour Port Lamy (Candilis, Josic, Woods)

Le CORBUSIER (1927) *Towards A New Architecture,* Architectural Press, London.

LETHABY, W. (1974) *Architecture, Mysticism and Myth,* The Architectural Press, London.

LYNCH, K. (1970) *The Image of the City,* MIT Press, Cambridge, Massachusetts.

McHARG, I.L. (1969) *Design with Nature,* Doubleday, New York.

MEAD, G.H. (1934) *Mind, Self and Society, ed.* G.W. Morris, University of Chicago Press, Chicago.

MEIER, R.L. (1974) *Planning for An Urban World: The Design of Resource - Conserving Cities,* MIT Press, Cambridge, Massachusetts.

MORE, T. (1949) *Utopia, trans,* and *ed.* H.U.S. Ogden, AHM Publishing Corporation.

NEWMAN, O. (1972) *Defensible Space,* Architectural Press, London.

NORBERG-SCHULZ, C. (1974) *Meaning in Western Architecture,* Studio Vista, London.

NORBERG-SCHULZ, C. (1980) *Genius Loci,* Rizzoli, New York.

OLIVER, P. *ed.* (1975) *Shelter, Sign and Symbol,* Barrie and Jenkins, London.

PASK, G. (1976) *Conversation Theory : Applications in Education and Epistemology,* Elsevier, Amsterdam.

PEIRCE, C.S. (1940) *Selected Writings, ed.* J.Buchler, Harcourt, Brace and Co., New York.

POLANYI, M. (1958) *Personal Knowledge,* University of Chicago Press, Chicago.

POLANYI, M. (1966) *The Tacit Dimension,* Doubleday and Co., New York.

POLANYI, M., PROSCH, H. (1975) *Meaning,* University of Chicago Press, Chicago.

PROSHANSKY, H.M., LITTLESON, W.H., RIVLIN, L.G. (1976) *Environmental Psychology,* Holt, Rinehart and Winston, New York.

RAPOPORT, A. (1969) *House Form and Culture,* Prentice-Hall, Englewood Cliffs, New Jersey.

RAPOPORT, A. (1977) *Human Aspects of Urban Form,* Pergamon Press, Oxford.

ROSENAU, H. (1972) *The Ideal City,* Harper and Row, New York.

ROWE, C. (1976) *The Mathematics of the Ideal Villa,* MIT Press, Cambridge, Massachusetts.

RUSSELL, B. (1982) *Building Systems-Industrialisation and Architecture,* John Wiley and Sons, New York.

SAARINEN, E. (1958) Recent Work of Eero Saarinen, *Zodiac* (4) 30-67.

SAPIR, E. (1949) *Selected Writings in Language, Culture and Personality, ed.* D.G.Mandelbaum, University of California Press, Berkeley.

de SAUSSURE, F. (1960) *Course of General Linguistics, trans.* W.Baskin, New York Library and Peter Owen.

SCHON, D.A. (1963) *The Displacement of Concepts,* Tavistock Publications, London.

SCULLY, V. (1960) *Frank Lloyd Wright,* George Braziller, New York.

SCULLY, V. (1967) *The Earth, the Temple and the Gods,* Praeger, New York.

SEARGENT, J. (1976) *Frank Lloyd Wright's Usonian Houses,* Watson - Guptill, New York.

SITTE, C. (1965) *City Planning According to Artistic Principles, trans.* G.Collins, Random House, New York.

STEADMAN, P. (1979) *The Evolution of Designs,* Cambridge University Press, London.

SUMMERSON, J. (1963) *The Classical Language of Architecture,* MIT Press, Cambridge, Massachusetts.

TURNER, J. (1976) *Housing by People,* Pantheon Books, New York.

VALE, B., VALE, R. (1975) *The Autonomous House,* Universe Books, New York.

VENTURI, R. (1966) *Complexity and Contradiction in Architecture,* Museum of Modern Art, New York.

VICO, G. (1968) *The New Science of Gianbattista Vico, trans.* T.Goddard and M.H.Fisch, Cornell University Press, Ithaca, New York.

WARD, P.M. *ed.* (1982) *Self-Build Housing : A Critique,* Mansell Publications Ltd., London.

WATKIN, D. (1977) *Morality and Architecture,* Clarendon Press, Oxford.

WELLS, M. (1981) *Gentle Architecture,* McGraw-Hill, New York.

WHORF, B.L. (1956) *Language, Thought and Reality : Selected Writings, ed.* J.B. Carroll, MIT Press, Cambridge, Massachusetts.

WINCH, P. (1958) *The Idea of a Social Science and Its Relation to Philosophy,* Routledge and Kegan Paul, London.

WITTGENSTEIN, L. (1953) *Philosophical Investigations,* Macmillan, New York.

WRIGHT, F.L. (1941) *Frank Lloyd Wright on Architecture : Selected Writings 1894-1940, ed.* F.Gutheim, Duell, Sloan and Pearce, New York.

ZEVI, B. (1950) *Towards An Organic Architecture,* Faber and Faber, London.

ZEVI, B. (1978) *The Modern Language of Architecture,* University of Washington Press, Seattle, Washington.