

ECOLOGY, CULTURE AND COGNITION

A TEXT BOOK ON THE
PRINCIPLES OF ENVIRONMENTAL DESIGN

Thesis Submitted
for the Degree of
PhD in Architecture

by
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During my childhood, I was very fortunate to have my father, Mr. Abdul Razak, who was a very successful businessman, as my role model. He was a very hardworking man who always encouraged me to study hard and achieve my goals.

I am extremely grateful to my father for his guidance and support throughout my life. His teachings and values have been very instrumental in shaping my character and the success of my studies.

DEDICATION

This work is dedicated in fond memory of my brothers Abdul Razak and Sabah, and to my lovely brothers Gazi and Abdul Hafidh, to whom I owe much for their personal sacrifices, support and encouragement throughout my life.

My father, Mr. Abdul Razak, was a very successful businessman who always encouraged me to study hard and achieve my goals. He was a very hardworking man who always encouraged me to study hard and achieve my goals. His teachings and values have been very instrumental in shaping my character and the success of my studies.

My father, Mr. Abdul Razak, was a very successful businessman who always encouraged me to study hard and achieve my goals. He was a very hardworking man who always encouraged me to study hard and achieve my goals. His teachings and values have been very instrumental in shaping my character and the success of my studies.

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INTRODUCTION

Architecture is not just the activity of building. This is certainly true. Because man is an intellectual organism, he vividly employs his capacities to produce all kinds of artefacts that convey meaning and imply cultural dimensions. It is this very property that credits these artefacts with their aesthetics as well as their functional values. It is bitterly true, also, that the present architects and theorists have gone too far in expressing their fascination with this very notion in such an abstract, meaningless and alienating manner that one would prefer to reconsider Architecture for its own sake as a mere activity of building; no less, no more. A manifestation of the downfall of the 'Art of Building' is that it became precisely a profession devoted to a very special people. The new Elites, the architects of reputation, in order to express themselves only, are driving Architecture far from man. They have divorced Architecture from its physical setting and from society. They have denied its cultural, traditional and historical identity. They have disrupted its continuity by introducing 'EXHIBITION ARCHITECTURE' which is turning our environments into 'crowded and polluted deserts'. The graceful virtue of culture has become, accordingly, an expression of empty aestheticism, illusive intellectualism and a brutal tendency to reject the world's diversity. That Architecture, which rewarded all antecedent generations of various parts of the world with indulgent satisfaction and pleasure, has been callously sacrificed. That Architecture whose essence is deeply felt through its adaptability to different geographies and cultures has been misunderstood, misinterpreted and, it may be, brutally murdered. The word 'new elites' is meant to distinguish between some architects and theorists of our time and those great men of the past; anonymous builders, architects,

composers, painters, craftsmen, and others to whom we owe our civilised activities of hearing a piece of music, looking curiously at an artistic work, studying a historical building, touring a native village, or enjoying, with all our senses, a full perception of a world whose legacy of values, traditions and wonders are, partly, of their own creation. Those elites of the past were very ordinary people. They were the poorest and suffered the most, probably because they were persistently the most faithful of all in expressing their people's values, feelings and their reality. The Modern Movement is so preoccupied with abstraction and all kinds of enterprises that it must, at least, be described as implying ignorance to the 'practical', 'objective' and 'materialistic' values behind architectural aesthetics. I recall my colleague Murrad's idea that, at the present time, within the area of environmental studies there exists a huge number of contrasting, confusing and diffusing sets of theories within which it becomes impossible to resolve, separate and diagnose the various elements of the study. Therefore it is becoming quite imperative for any design research to imply a refusal, rejection and suspicion towards these abstract perspectives, and become aware of their socio-economic and political implications on the various societies and the blocked up enterprises to which they inevitably lead.

But it is not the architecture of single buildings that really concerns us. Rob Krier stated

"The architectural problem will neither explode nor emit fatal radiation. But the illnesses which may be created by chemicals which new buildings are stuffed with, I hardly dare to foresee. We wait with distrust and desperation for the results of all these experiments which have plunged us into a meaningless venture. Of course the individual case does not matter so much, but a host of bad architecture becomes threatening. A few ugly buildings would not be that serious a threat, but if they spread so that in the end hardly one percent of real quality is left in building activities, then the time would have come to sit up and take notice!

It is this current of deploying technology in almost every aspect of our life, including architecture, which one must question. Misuse of technology, or in other words, misfit technology, and the excessive passion for it has universally disrupted nature and the ecosystem by introducing new patterns harmful for the setting of many native societies. New architectural standards have been produced on international levels and based on different values than those which each culture or subculture has produced over centuries of experiments, refinement and elaboration. These standards are concerned less and less with design ideas and more and more with technology in its universal sense. Artificial needs, abstract trends and misfitting thoughts have obscured the fact that there is, now, no progress in architecture, but only progress in technology and its associated ideologies and concepts. What makes it more amazing and certainly serious is that present architects, as perhaps for a matter of prestige, no longer embark on their designs without the provision of these associated 'international ideas'. It is very sad that we are now more often exposed to universal education, immersed in totally irrelevant concerns in an environmental sense, developing dispositions of international flavour through the media, the press and through political channels, yet are totally unable to cross the borders to a neighbouring country for 'cultural reasons'!

The task in this study, hence, is not the introduction of other concepts or methodologies that might be added to the present set of contrasting concepts and theories. The aim, on the contrary, is to reject all these. It is to redirect attention to the simplicity of ecology (a broader perspective of the physical environment) and explore its vital and fundamental role in influencing people's behaviour underlying their values and drawing the principal components

of culture and cognitive knowledge, necessary for the elaboration of design ideas. The title "Ecology, Culture and Cognition", implies a significant theme which could indicate major traits that characterise modern practices and theorisation within the area of Architectural and Environmental Design studies. These are as follows.

First, a lack of consideration for the physical environment, its requirements and its role in producing diversified architectural forms. The most significant outcome of such a position lies in divorcing nature, its laws and the ecosystems on which man has spent the preceding history elaborating building patterns on the basis of utilising them for his interest free of charge and without consequences to his survival. The fact is that different cultures, ways of life and differentiated built environments, which can only be attributed to man's adaptation to different ecological conditions, have been widely swept away under the mythical notion of 'international style'.

Second, because the architects and theorists of the modern movement admire (and have been excessively involved in) mental constructions and abstract philosophies of their own, they have advocated an alien and distorted meaning of the concept of culture. The most likely interpretation of this vital concept is that it is viewed as related to a kind of abstract intellectual capacity in the human brain that does not lend itself to variation in the physical setting. Tragically, the adoption of such a view has resulted in sweeping away many small and subcultures which have been developed in remote areas in accordance with their geographical setting. The most acceptable meaning of culture has been to imply the role of physical environment in shaping social relations, the modes of thought, norms, beliefs, ways of life, the ideologies and the total range of customary

behaviour, all of which have been influenced by people's adaptation to their environment. Therefore, building forms, patterns of growth, town morphology, in short, architectural phenomenon, has, like culture, evolved characteristics from its natural habitat. We now often observe that such an argument is totally diminishing in the present architecture and in the environmental activities of those in charge.

Third, the interruption of continuity and flow of human cognitive knowledge by introducing techniques and thoughts whose practical values, aesthetical capacities and meanings do not correspond with people's knowledge of the environment, building behaviour or activities associated with the history of people's relation to their own habitat. This study argues that building materials, the various architectural elements (arches, roofs, walls, windows, etc.) as well as the various land uses and activities maintain certain images and have certain cognitive values and schematic representation both of an experiential and cosmological nature. Therefore the designer's task is not to express ideas or induce feelings, but actually to search for the cognitive values and images and consider them as the essential criteria to meet people's physical and cultural needs.

Therefore the study aims to explore the notion that human achievements, i.e., cultural, technological, architectural, etc., are an outcome of the interaction between ecology, culture and cognitive structure. Such interaction is thought to set out a condition of stability, compatibility and fitness which characterises various vernacular cultures. These notions ought to be investigated and hence utilised in design ideas and design processes. To illustrate the various aspects of this interaction, the thesis has adopted a holistic view which incorporates many elements that

underly the environmental phenomena; its structure, its laws of evolution and its adaptive processes. The following is a brief summary of each chapter of the thesis.

Chapter One: In any design research it is more important to arrive at appropriate identification of a problem before being preoccupied with 'assumptions' to solve that problem on the basis of its 'external' appearance. Each environment has a specific structure which accommodates in a certain pattern its various components such as the social boundaries of interaction, the particular physical structure, building patterns, behaviour, mode of thought, economic system and so on. It is only by tracing the history of development of each of these components within this structure that a solution can be fitting and relevant.

The chapter reviews some problems and controversies raised by adopting a misfit technology and its implication on various cultures as well as on Architecture.

Chapter Two: This chapter suggests a general theoretical framework which rejects the harmful and unifying effects of those 'fragmented' approaches within design disciplines. In fact they came as an outcome of the passion for misfit technologies, the non-environmental views of culture and ideologies normally associated with them. It is hence the interplay of the three elements of Ecology, Culture and Cognition that result in architectural quality most fit to its context. The objectives of such a framework are: the protection of the natural ecosystems and their manifestations in design; the establishment of a self-sustaining way of life; and finally, setting policies that give priority to bettering the ecological qualities as a basis for improving other aspects.

Chapter Three: In this chapter a broadening perspective is introduced to define ecology according to its concerns for the conditions and interactions that determine the distribution and abundance of organism in a certain setting. The perspective includes culture as well as the other biological and physical factors on the basis of considering culture as a manifestation of man's adaptation to that setting. It is very important to consider the role of ecology in differentiating various societies; their cultures and architectural forms.

Chapter Four: The second element, culture, according to the school of cultural-ecology, is made up of the modes of thought, the ideologies, energy systems, artifacts, the organisation of social relations, norms and beliefs and the total range of customary behaviour, all of which have been influenced by the physical setting. The concept of 'cultural core', introduced by J. Steward, is adopted for its importance in distinguishing cultural features in terms of their physical belonging. It helps, hence, to advocate solutions more fitting to their 'authentic context' in the face of the bustling, overlapping and usually more abstract cultural features of the external phase (secondary features).

Chapter Five: Knowledge is the central element in design, and cognition has been defined as the activity of knowing: the acquisition, organisation, and use of knowledge. The human cognitive structure selects and interprets environmental information in the construction of its own knowledge, rather than passively copying the information. The mind does this to make the environment 'then' fit in with its own existing mental framework.

Chapter Six: Because man and nature form two elements in one system, man has accumulated a profound knowledge of the various elements in nature including natural materials. This knowledge is

embeded so deeply in his psychological structure that his innate disposition towards natural elements has been extended to include all interactional modes, subsystems and visual structures which they initiate.

The concept of schemata was introduced within cognitive psychology to explain some controversial issues in the field of accepting, restoring and processing information. Schema is defined generally as a data structure for representing the generic concepts stored in memory. There are schemata representing our knowledge about events, actions, objects, etc. They also contain the network of interrelations between these concepts. It has been suggested that the source of this knowledge which schema represents comes from one of two resources; 1) immediate information of the physical objects, 2) the innate and stored knowledge in the human mind. Both resources, however, can provide information to what the study calls experiential schemata.

The important contribution the study offers is the concept of the cosmocognitive schemata. They are the schemata that represent the point where both organism and the universe meet and represent, man's extension in space and time. With these schemata we can explain many phenomena in which people of totally different cultures, different experiential schemata, respond and react similarly. In other words, the various authentic capacities of objects, their various properties and potential dispositions towards interactions are all taking precedence in the organism's neural system.

The concluding notion of this important chapter is that man has been vividly and maybe unself-consciously utilising the 'cosmo-cognitive' knowledge in the adaptational processes, blended with activities of the experiential knowledge, in the elaboration of the various architectural forms and patterns. Therefore, it is

suggested that it is extremely important to establish a theory of environmental quality based on cognitive knowledge.

Chapter Seven and Chapter Eight: In these two chapters, the study introduces the most influential factors which define the ecological setting in general. These factors are considered as being the permanent constructs of human cognitive knowledge and hence have to be well studied before making any decision concerning the nature of the design solution proposed to any society.

Chapter Nine: It is suggested that the influence of ecology and nature on human beings takes place and is utilised over long processes of adaptation. The mechanism and other elements of these processes are explicitly demonstrated through a model that the study elaborates. The main idea this model presents is that man, during the emergence of his settlement, initially responds to nature and the physical properties of that setting. He first develops prototypical patterns to embody their impact, according to which he then develops his social and behavioural patterns. Out of the interaction of these components and their various elements, and by reference to his experiential and innate knowledge, he then establishes his traditional culture of which architectural phenomena is the most conspicuous feature.

Chapter Ten: Beyond the aesthetic values of architecture: decorative form and ornaments, and beyond the persistence of architectural pattern and activity types lie empirical, structural, functional and practical principles. The basic aim of arriving at a concrete understanding of what underlies the aesthetic characteristics is that once such an understanding becomes possible, designers would be able to manipulate their design ideas following the same principles of authenticity and purposefulness rather than attempting further implication or inventing more fantasies.

The title implies that material's authentic properties, architectural and structural elements and activities have cognitive values which are represented in certain characteristics. And it is these values that a designer should, in fact, search for, if satisfying people's real preferences is one of his interests.

Chapter Eleven: The outcome of the interaction between ecological/cultural variables and cognitive structure consists of several components. These have to be carefully matched in setting design criteria within any context. They can be referred to in any judgement over the fitness and appropriateness of any design idea in hand.

Before concluding this introduction I would like to maintain that the reason why some subjects were presented so explicitly, e.g., the climate, is that although very simple, factual and widely accepted, it is also true that many architects are hardly aware of their specific implications in design. I have benefitted from many invaluable studies and writings which I found very useful, relevant and corresponding with the central themes of this study. I would, therefore, like to express my gratitude to the authors of these writings, notably Philip Steadman, Roger Scruton, J. Steward, J. Berry, Sahlins and Service, Eisenck, Neisser, Flavell, A. Rapoport, Alexander, Moholy-Nagy, T.O. Riordan, E. Relph, as well as others.

Chapter One

NATURE OF THE CONCERN

A Critical Analysis of the Technocentric Cosmology and its Manifestations in Architecture

Chapter One

NATURE OF THE CONCERN

My study task is one of integrating the concept of design with ecology; human natural habitat. My purpose in this chapter, therefore, is to introduce current problems facing human ecology and to identify certain relevant controversies that gave rise to my interest in the subject of this thesis. In order to reach an appropriate assessment of these problems and, before examining them, it seemed to me that, it would, perhaps, be useful to account for certain principles upon which the decision about the nature and significance of an environmental or design problem is essentially based.

As Christopher Alexander stated, "the mental images with which self-conscious designers represent the contexts of design problems are incomplete and incorrect. They fail to correspond properly in their structure to the real situation" (C. Alexander 1964). I agree with Alexander that this is a major cause of trouble and failure in modern design practice. His idea is that the designer makes an assessment of the structure of the problem in hand, by reference to a set of 'conceived' mental images. In order to make the complexities of the problem more manageable, the designer analyses its structure into a number of component parts which he can then tackle separately. It is this kind of mental analysis that fails to represent correctly the true hierarchical structure of the problem as it really is. That is, each factor that the designer attempts to get right in one part of the problem sets off

a series of ramifying effects in other areas which upset whatever progress he may have already achieved.

The implication is that if the designer can understand the real hierarchical organisation of his problem, he will be able to make changes to his design in a way that is 'cumulative' and does not undo his previous work.

Here I will attempt to demonstrate in three steps the way a problem can be precisely identified with its specific situation and be attributed to the correct order within its hierarchical structure.

1.1 IDENTIFICATION OF PROBLEM

In the literature of design research, most attention has been given to the question 'How to solve a problem'. For the purpose of achieving an appropriate solution I would suggest that a more fundamental question should be 'How to identify a problem; that is, to investigate what underlies its 'external surface', and where in the historical and evolutionary processes and hierarchies of the man-environment relationship this problem locates itself'. In other words, beyond the immediate character of a problem lies a multiplicity of factors. They are structured in a specific hierarchical organisation and set up in accord with temporally derived causative relationships. The actual implications of such structure of factors lies in the very principles which control the processes and timing of the various events, and behavioural patterns which have characterised human environment and cultural adaptation. It would follow that without a profound and cumulative knowledge of this structure, the designer will inevitably fail to cope with his design problem and will fail to produce the appropriate proposals.

Not only is this knowledge essential for the production of more fit designs, but it might then, when possessed, 'consciously' inspire contemporary practices by "making the solutions correspond properly in their structure to their real situations" (C. Alexander 1964).

From a rather similar point of view, we can trace three steps that might have to be carefully followed in order to make the identification of the problem an appropriate one.

1 - Recognition and Relevancy of the Problem

It is necessary to recognise the problem and justify its relevancy to its indigenous context. This may, as a result, imply a decision about whether a phenomenon is inducing trouble and hence requires an act of a certain kind, or whether the phenomenon is an evolutionary feature. That is, on various occasions the perceived problem might embody a false assumption in the first place. This will mean that its solution would logically tend to be of an illusive nature. We can cite many examples. For instance, no one doubts that misconceiving the social implications of the climate in arid regions or the climatic effects on a settlement's morphology can bring about some problematic consequences when such misconception is interpreted in practice. On the other hand, to assert that religion does influence modern development in Iraq, for example, is false assumption in itself. Therefore, any design arrangements which inspire such a notion, or are based on it will inevitably be inappropriate and misleading. In reality, there is no possibility of tracing any sort of effective connection between religion and modern architecture in that country, a fact which is believed to be quite indisputable.

2 - Describing and Gathering Data

There are many indications that, perhaps either for linguistic reasons or for personal predilections, the act of describing or communicating information tends on many occasions to produce a false or incomplete, or even a distorted, picture. More immediately dangerous are those cases where some designers propose solutions based on information and data gathered to conform initially with their personal tendencies or to respond to their professional techniques and design methods (such as the case with gathering and programming data for computers or for carrying out various questionnaires).

Certainly it is not in the interests of efficiency that we limit the management of information required for designs to any pre-established method that, for technical reasons related to the nature of the method, tends to yield one outcome more frequently than others. Nor should we intentionally employ sophisticated expressions of linguistic difficulty in describing simple facts, seeking the attachment of complexity and the provision of acceptance for our initial assumptions. Clearly then, the credibility of data is secured by the ability of the designer to distinguish between describing a situation and ascribing it as well as by his commitment and loyalty to the outcome of his research.

3 - Causative Factors; their Temporal Order

This analysis traces the unsullied origin of the various environmental phenomena in hand (e.g. social interaction, building compactness, etc.). These phenomena are usually strongly interwoven and overlapped and some of them are the natural results

of the others. They occurred during certain periods of man's adaptation to his physical environment. By attributing the phenomenon to its real cause it becomes possible to recognise any occurring problem in terms of its proper and relevant situation within the whole web of environment. It is argued here that embarking on a solution without attributing the problem to its proper situation might lead to further problems. For example, considering the social structure of the inhabitants of one of the towns in an arid area, the designer may observe a high interactional intensity among the people and may attribute it to the people's predisposition or tendencies that may characterise most societies of this region. As a result he then may arrange his design merely to meet the social requirements disregarding the kind and quality of the materials or techniques that may not fit with other environmental aspects (FIGURE 1). We will come, through this study, to the point where we see that specifically in severe physical conditions the social structure is essentially shaped by people's adaptation to their built environment which, in turn, has been elaborated on in accordance with the prevailing physical conditions.

One expected consequence of such concerns with the social aspect, especially when viewed independently from the prototypical physical structure, is that the design may tend to impose harmful effects on the social structure itself. It tends also to handicap the environment's performance to meet its climatic and physical conditions (as in many new housing developments in the Middle East, for example; FIGURE 2). On one hand gathering social information has required the development of various methods and techniques (i.e., questionnaires, mathematical calculations, etc.) which are mainly based on the researcher's attitudes (SEE ARTICLE 1.6.4), but on the other hand the whole approach may be faced with the difficulty

of interpreting these findings into a physical design proposal. In many instances the architect may have risked the environment by inventing a problematic social theme in order to elaborate fascinating design ideas. This situation suggests that those architects lack the real knowledge of the environmental structure which their solution should embody.

It is argued here that many contemporary concepts of architecture are basically built on a wrong assumption that certain individual aspects, such as the social, aesthetical, physical, etc., underlie the environmental quality. (Such approaches have been widely considered when designing for third world countries. This may be due to distinct social features these countries exhibit which attract the designer in the first place.) In my opinion, the approach is significantly dangerous. Firstly, social norms and beliefs, behavioural modes, rituals, in short, cultures, can provide illusive cues. This is so because of apparent similarity and overlapping which many socio/cultural features exhibit even among societies of different physical settings. Secondly, it can be suggested that due to the influence of acculturation on the present various societies, and the adoption of the international style, it is becoming far more difficult to distinguish those genuine socio/cultural values which maintain their interdependent relationships to their natural habitat from those exotic values which are acquired by diffusion. Finally, history may provide us with evidences that in many instances social structure did not primarily determine the physical and spatial structure. On the contrary; except in a very few cases, social context, which is a constellation of behaviours, attitudes and norms, was formulated and characterised by the inhabitants adaptation to the prototypical architectural patterns and the physical structure during the early emergence

of their settlement (SEE ARTICLE 9.4). It has been adopted in this study that the prototypical patterns developed in each region in a specific way. They, proceeding from the simple to the complex, acquired their characteristic forms and consequently their symbolic meaning and aesthetical values as an outcome of man's adaptation to his native natural habitat (SEE ARTICLE 9.4.2).

1.2 STRUCTURING FRAMEWORK

It appears implicitly compelling to state that if we are to set design criteria for any environment then we should consequently consider the ecological settings behind the social and cultural contexts. IT IS ONLY THROUGH THE INVESTIGATION INTO THE SPECIFIC ECOLOGICAL SETTINGS THAT THE SOCIAL AND THE CULTURAL PROCESSES CAN BE COMPREHENDED AND HENCE PROPERLY IMPLEMENTED IN DESIGN. If it were ever suggested that a doctrine should support any principles of design it must be a framework of such kind which achieves its aims, not by producing an overly intellectualised approach, but by exploring the underlying structure of any environmental phenomenon. BUT IT IS VERY IMPORTANT TO AVOID THE UNDERSTANDING OF SUCH A FRAMEWORK AS BEING ONE OF THOSE INDIVIDUALISTIC VIEWS FORMULATED IN RESPONSE TO INTELLECTUALLY EXERCISED REFLECTIONS RATHER THAN TO FIELD OBSERVATION INTO EACH LOCAL AREA AND ITS INDIGENOUS CONDITIONS. It is suggested (Alexander 1964) that the FITNESS of any built form is achieved not according to an intellectualised concept.

1.3 INDUCTION OF ATTITUDE

At the present time, the great paradox of the current interest of modern designers in traditional and historical architecture can certainly be seen through the use and revival of the various

primal and prototypical elements (e.g. arches, columns, heavy masonry, etc.; FIGURE 3). Although such an approach is meant to attach originality to the designs, the attempt remains far from achieving this desired quality. ONE CENTRAL CONCERN OF THIS STUDY IS THE INDUCTION OF ATTITUDES TOWARDS THE BASIS UPON WHICH, INNATELY RATHER THAN ARTIFICIALLY, A DESIGN SOLUTION OR ARCHITECTURAL FORM CAN BE ECO/CULTURALLY AND COGNITIVELY FIT.

I stand with those who are reluctant to commit themselves to the adoption, by imitation, of the traditional and historical forms and techniques on a chaotic and artificial basis which fit into certain preconceived thoughts presented by the modern designer. One can suggest that traditional architecture has been a heritage of a phenomena which flourished once in time, hence to revive it is to deny the evolutionary processes of cultural adaptation. There is plausible logic in this assumption. At the same time the search for contemporary equivalent fitness within the modern movement remains sterilised and confined to chaotic interpretations. Still there may well be some value in the traditional thesis: one may conceive some permanency underlying the phenomenon in its achievement of the strongest and most convincing solutions. Considering that social/cultural and behavioural factors are thought to be adaptively variable, i.e. changeable, the phenomenon of traditional architecture should have been structured around a dynamic constellation of persistent factors that, simply, nature and the ecological conditions provide. The power of these interdependent factors is associated with the permanence and stability of the laws of nature and the ecosystems. It is hence trivial to attempt to promote equivalent approach based on the superficial implementation of the visual and perceptual capacities of some elements and features that are borrowed from the past. Nevertheless, it can be

argued that the current appreciation of the vernacular and traditional architecture implies in itself a dissatisfaction with contemporary architecture and this has been an increasing trait among the new generations of architects, as it is among the general population.

1.4 CURRENT ATTITUDES

One type of thinker, particularly the new environmentalist, would place responsibility for the current attitudes on the technocentric movement. It universally disrupts the nature and the ecosystem by introducing artificiality, permeating many aspects of our social and cultural life including architectural thought. The environmentalists associate the loss of identity, the dehumanising and desocialising effects of rapid industrialisation and urbanisation, the pollution, the crimes, the impersonal and alienating atmosphere of the big cities and the whole urban decline with a PASSION for high-impact technology (T.O. Riordan 1976). The study will argue that, whereas this passion induced many environmental conflicts, it, together with the non-environmental views of culture, has driven architecture far from nature and ecology; the indigenous generative of its forms and patterns.

1.4.1 The Non-Environmental Views of Culture

1 - Holistic View of Culture

It has been thought that the passion for technology corresponds with the line of thought which regards the entire pattern of technology, architecture and social features as derived entirely from culture (J.H. Steward 1972). This view has been so preoccupied with culture, it has accorded environment only a negligible

role, owing to the evidences that any culture increases in complexity to a large extent because of diffused practices rather than adaptation to the environment.

2 - Historical View

This view considers that cultural differences are not directly attributable to environmental differences, and most certainly not to organic or racial differences. They are merely said to represent divergences in cultural history, to reflect tendencies of societies to develop in unlike ways. Such tendencies are not explained (J.H. Steward 1972). A distinctive pattern develops and henceforth is the primary determinant of whether innovations are accepted. Environment is relegated to a purely secondary and passive role. Followers of this view consider environment as being prohibitive or permissive, but not creative. It allows man to carry on some kinds of activities and it prevents others. The origins of these activities are pushed back to a remote point in time or space, but they are not explained.

3 - Closed-System Perception of Culture

This view is attributed essentially to Leslie White (L. White 1949). His perception of culture is that it consists of three interrelated subsystems: technological, sociological, and ideological. The technological component is the fundamental determinant of the others, and technological development is the impetus for general progress. However, one may observe that culture here is viewed as a closed system (M. Shalins and E. Service 1960); that is, culture is taken out of particular and historic context, without regard to the actual course of development or environmental

circumstances. Hence, the general form of the social and the ideological spheres of a culture are determined only by its technological attainment.

1.4.2 The Technocentrism

Another movement of ideas whose ecological implications, according to this study, (as well as to many others) have contributed to the growth of immense environmental concerns, is technocentrism. The study of its influences on architectural realms in particular and on the whole web of our present life in general, is of obvious complexity and controversy. However, this viewpoint is considered as the application of rational and "value-free" scientific and managerial techniques by a professional elite who regarded the natural environment as "neutral stuff" from which man could profitably shape his destiny (Hays 1959). Technocentrist ideology is almost arrogant in its assumption that man is supremely able to understand and control events to suit his purposes. This assurance extends even to the application of theories and models to manipulate and predict changes in "value system" and behaviour, while the exercise of science to manage nature has been assumed for some time.

Technocentrism ignores ends and focuses more on the means since its optimism about the continued improvement of the human conditions allows it to be rather less troubled about the evaluative significance of its achievements. It admires the comforting power of technology and is usually found among an urban-dwelling elite who tend to be politically influential for they usually move in the same circles as the politically and economically powerful. However, whether man's concern is to protect and preserve biotic rights or to

transform a forest into a residential suburb, the act is conceived by man in the context of his social and political culture. The distinction between technocentrism and any other environmental approach relates to the "values" that are associated or brought up with this act and the estimation of the likely consequences. The technocentrist mode is identified, generally, by rationality, the objective appraisal of means to achieve given goals; by managerial efficiency, the application of organisational and productive techniques that produce the most for the least effort; and finally, by a sense of optimism and faith in the ability of man to understand and control physical, biological and social processes for the benefit of present and future generations. These principles, no doubt, downplay the sense of wonder, reverence, and moral obligation that are significant excessively for the continuation of balanced relations between any generation and its physical environment (T.O. Riordan 1976).

The growing specialisation and complexity of resource investment techniques soon separate the administration and policy makers from the public by great ignorance. They will be increasingly influenced by the advice presented to them by professionals and the elite. So by degrees professionalism implies specialisation and is often accompanied by a reluctance to accept the opinions of people who are regarded as uninformed. In architecture, comparatively, and regarding personalisation, there is evidence of almost desperate attempts by people to do just this, which will anger the designer for the changes induced by people to his building. In this context some have suggested that we generally consider the meaning that a building has is only for the architects, the critics, etc. If we ask, then, what meaning a building has for its users

and inhabitants, the answer will be that the meaning a built environment has is that given to it by the process of personalisation (Rapoport 1967). A criticism of professionalism stated that it is not simply specialised competence but a tribal ideology (J.G. Davies 1972). It is a collective memory of the struggles, defeats and victories of an incipient movement and of its drives for recognition and professional status.

One major characteristic of the technocentric mode has always been its optimism, especially a faith in the technology of intervention and manipulation. The application of scientific knowledge to improve the condition of man is automatically accepted as a fundamental, even though there are no commonly accepted yardsticks by which to measure improvement. Optimism over man's endeavours should be confined to the extent to which his act maintains intact his physical, social and cultural environments.

1.5 MANIFESTATIONS OF THE CURRENT ATTITUDES

It seems important to look rather closely to see precisely how this new attitude created by the passion for rapid and misfit technology and the adoption, particularly in architecture, of the non-environmental views, have been interpreted in the various aspects of our environment, and to determine whether there are lessons for the present-day designer.

1.5.1 Upsetting the Balance of Nature

Man is the least stable element in nature by virtue of his capacity for competition and for both undergoing and initiating change. He has greatly altered the biotic mantle of the earth. There is a general tendency now to denounce modern man for upsetting 'the balance of nature'. Man has altered in varying degrees many

principal components of his natural environment. The number of animals that accompanied him is enormous. But, whereas for a long time he merely collected the plants and the minerals, he hunted and killed the animals and sometimes destroyed them altogether, as he still does, leading to the extinction of many species all over the globe.

The primitive vegetation cover of the earth has been vastly altered through human agency. The history of ancient man shows how fire was used to burn dense thickets to deprive dangerous animals of their hiding places. The major consequences of burning are that vegetation complexes are simplified and the scales are tipped against the slow-maturing trees. When a change in vegetation cover occurs the character of the supporting soil will be altered. However, the most extensive damage to the soil mantle is attributed to commercial and mechanical agriculture. The breaking up of soil structure by powerful machines is one of the factors that makes for extensive and long-enduring alterations of the earth's mantle. The modern city of concrete and steel, spreading in a tentacular fashion into the countryside, is at present the most forceful expression of man's conquest of nature. Built areas will seem more threatening if one envisages the rate at which the world will disappear under concrete and asphalt.

Climate is another component which has been vastly affected. In the densely settled parts, man has significantly altered the local climate but he has yet to gain control over the atmospheric heat engine on a global scale. The change from forest to field alters the local heat balance, and introduces greater temperature extremes at the soil surface. In addition, it decreases the amount of oxygen in the air.

One consequence of the change in the earth's surface condition, due to the increase of farming which replaced the forest, is that new diseases could be (and have been in the past), transferred from animals, attracted around man, and adapted to the new conditions. But every race of mankind, exposed to these new diseases, developed its own genetic devices for acquiring resistance to them. Some of these handicapped the people that acquired them (C.D. Darlington 1972).

When some distant places were discovered by the Europeans they were inhabited by peripheral and isolated populations. They lacked both diversity and specific resistance to diseases which had been developed in the civilised world and had reached their epidemic climaxes. The results are well known: the vanishing and destruction of these peoples (such is the case with the Amazone tribes). By man's own action the impact of man on nature had been drastically reversed.

In his article "THE IMPACT OF MAN ON NATURE", C.D. Darlington summarised his opinion stating that "Now we had the impact of nature on man or on some men, instead. And because the impact in this case was sudden and recent, its cause could not be mistaken". He concluded his article by arguing that devastation of a different kind is revealed in the most advanced industrial societies. The technical exploitation is reaching terrifying limits. This shows that these societies are at once the most enlightened and the most dangerous of all. That is, every invention of man has made his environment more favourable for his short-term multiplication. But, on the other hand, it has made his environment less favourable for his long-term survival. The driving force of man's evolution has been selection for competitive success in invention and also for the competitive multiplication of those who succeed. And

largely it is these two forces which have brought the full impact of man to bear on his environment. I quote here the rest of this article.

"The effects of that impact are to threaten his means of sustaining life as an individual; and to favour the diseases that threaten his life in a community. He has been brought to the point where, tightly packed in numbers and partly fixed in character, in beliefs, and in institutions, he has come near to being deprived of his initiative. . . he may have to reverse his initiatives: to regard his virtues as vices, his successes as failures: to admit that all harm done to nature is harm done to man; and hence to scrap some part of his morals, natural or official, and of his religion, pious or political, to scrap them, strangely enough, both East and West. He may even have to allow that standards of right and wrong can never be uniformly applied to different peoples, to different classes or even to different age-groups in a world of rapidly changing structure. . . Man depends on nature. The supply of what nature offers him is limited. He uses up nature in proportion to his numbers. But some men use up nature faster than others. Some employ nature more wisely than others, preferring the distant future to the immediate future. Some, for this reason, give more in return to nature and to mankind. What has happened in the past shows us that all these factors must influence our judgement in deciding how man will have to make his reckoning with nature in the future".

1.5.2 Displacement of Ecological Systems

Concern about environment is much more publicised today. This is due to the ever-increasing injuries to the biosphere by events which continually upset a balance originally thought to be well established. We do not know whether the planet will be burnt up by the unbalancing of its radiation budget, or whether a film of dust will blank out the sun's rays, or whether it will explode in an atomic war. Furthermore, the pollution of industrial societies is to be found not only in the air and in the water, but in the slums and the traffic jams, and not in these only as physical objects, but as ourselves in them and in relation to them (R. Williams 1972).

It might be important to outline some ideas that characterise the origin of these environmental problems. It was argued that the environment is something which is physically and chemically determined by the activity of living things (B. Commoner 1972). As an example, before green plants appeared on the earth there was no oxygen in the atmosphere. The development of photosynthesis changed the chemistry of the air, etc. With the development of oxygen, ozone was produced. It shielded the surface of the earth from ultra-violet light. Hence it became possible in the course of evolution for organisms that used oxygen to evolve and survive as well as for those living animals to come out from their shelter of water to the surface of the earth. The dependence of one life process on another; the interconnected development of living and physical processes of earth, climate, water, plants, and animals; the continuous transformation and recycling of living and non-living materials; these are the elements of the self-perpetuating biosphere that sustain life on earth and which give rise to the physical landscape. They become the central determinants of form for all human activities on the land (M. Hough 1984). In other words, there is an interlock between life and the physical and chemical attributes of the earth, generating a very complex system which is mainly characterised by circular activity and is usually called the ecological cycle.

One major feature which is characteristic of this system is that any member or element of the cycle, functioning in its ordinary way, is incapable of causing trouble. So what went wrong with our environment and how did this system break down? In answering this question, B. Commoner suggested that we eat animals which eat grass and deposit our organic waste on the soil which

the cycle then converts back into the grass; there would be no way to degrade this environment: only when there is external stress would the cycle break down (B. Commoner 1972). For example, man is taken off the soil and put into a city; food crops must now be transported to the city, eaten, and converted into sewage, which goes into the aquatic system rather than back to the soil. Now there is more organic material coming into the aquatic cycle than the cycle itself produces. It is rapidly decayed by bacteria, which in the process may use up all the oxygen. With no oxygen left, the bacteria die off and the cycle stops.

It seems without doubt that in our time man, by virtue of his economic activities, is deliberately breaking down as many ecological systems as his activity requires in spite of the fact that they have been for a long time contributing to his prosperity and so far to his survival. Let us examine another example in which nature, through a different ecological system, works out human needs with no environmental problem and free of charge.

B. Commoner mentioned that cotton is made from carbon dioxide and water. It requires energy to put together their atoms which the plant takes from the sun free of charge and with no smoke or fume. It hence traps the sun's energy in the form of a fibre. But not satisfied by these benefits, we replace cotton and wool with synthetics. The nylon, for example, has to be extracted by distilling from petroleum. This requires immense energy. It comes from burning petroleum accompanied by a lot of fuss and fume. We are turning to a process of using energy in an air-polluting way in order to produce a fibre which we could get naturally and quite free of charge.

When the new building patterns and techniques were produced, they entailed drastic changes in the physical structure of the

existing cities and required completely new layout ideas and design approaches. Although they were developed essentially within the cultural context and physical and climatic condition of the industrial societies, they raised ongoing disputes about their implication on the cultural and social structure of the community. Furthermore they always present the difficulty of high running cost and maintainance due to both the use of machinery and the need for energy.

It is strikingly astonishing that in spite of the controversial values of these techniques within their context, they were transmitted, under the mythical forms of the international style, to other societies of entirely different cultural/social and physical settings. They displaced an ecological system which man (as part of the system) has been elaborating on for thousands of years and which embodied optimal performance compatible with the socio-cultural and physical settings, free of charge. For example, in the hot arid areas a simple way of utilising the cooled air is to let it sink into a small enclosed courtyard. This acts as a basin trapping the cooler air and allowing it to flow into the rooms around the courtyard, while heated air from the rooms of the courtyard can rise unhindered (FIGURE 4). On the same principle of the natural processes, each element of the Arab building contributes to a comfortable environment, internally and externally and all work in harmony together. No fuel and no machinery are needed to achieve suitable regulation of the thermal environment. On the other hand, in spite of the rigidity of the house plan, there is considerable opportunity for informality with functions, allowing a flexibility of use related to climatic as well as social and cultural requirements.

Following the displacement of these natural properties with artificial means, it is hard to estimate the social disorder, nor is it possible to assess the economical and environmental consequences that people of such societies will undermine. That is, if the adoption of alien technologies not compatible to the environment achieves some success it is, inevitably, a success on a microscale and within a very limited period. That is, the continuity of performance of these means is subject to the availability of cost payments and economic flourishing, and will condition the political capacities of societies lacking both local technologies and raw materials sufficient to run and maintain these edifices. Unless a major geological event occurs, these artificial edifices will not be able to alter the main and basic natural and climatic conditions and the first cause of the indigenous architecture and environmental quality determinant will remain the same. THE MAIN REMARK THAT I WANT TO CONVEY HERE IS THAT SUCH DISPLACEMENTS OF ECOLOGICAL SYSTEMS HAVE ORIGINATED IN THE SOCIAL MISUSE OF TECHNOLOGY, IN OBJECTIVES MORE CLOSELY RELATED TO PROFIT THAN TO HUMAN WELFARE. THE SOLUTION FOR THESE PROBLEMS WHICH THE UNSUITABLE TECHNOLOGIES HAVE CAUSED IS A NEW ADOPTION OF LOCALLY DEVELOPED TECHNOLOGIES THAT ARE COMPATIBLE WITH THE ENVIRONMENT.

1.5.3 Geographical and Architectural Uniformity

The contemporary architects are challenged and puzzled in every aspect by technology, economy and a decreasing commitment of the public in the cultural and aesthetic values of their own natural and ecological environment. Although natural forces are now countered by technology, the first cause of domestic architecture is still the same. Natural environment, which is believed to threaten man, has been replaced by industrial

environment which threatens the whole web of human life with far more extreme forces than hurricane, volcano, tropical heat, etc. However, the clever selection of domestic materials and skills which countered natural resistances, the exploitation of site conditions, and the adaptation to microclimate, etc., gave to buildings their perpetual beauty and strength as well as their distinct diversity. Indeed, there is a widespread belief that the localism and variety of places and landscapes which characterised pre-industrial societies and vernacular cultures are being diminished and replaced by the monotonous so-called international style (E. Relph 1976). C.W. Moore wrote "the richly varied places of the world . . . are rapidly being obliterated under a meaningless pattern of buildings, monotonous and chaotic". On the other hand, and as Dubos stated, "one can take it for granted that latent potentialities have a better chance to become actualised when the social environment is sufficiently diversified to provide a variety of stimulating experiences, especially for the young. By contrast, if the surroundings and ways of life are highly stereotyped, the only components of man's nature that flourish are those adapted to the narrow range of prevailing conditions" (Dubos 1968).

It might be regrettable to admit that what is appearing now is the grand scale and virtual absence of adaptation to local conditions and everywhere the shallowness of experience which it engenders and with which it is associated. The present significance of these remarks lies not only in the undesirable psychological, social or aesthetic consequences of the disappearing variety in architecture. It lies basically in their implications on the survival of various domestic cultures as well as in the threats to the life of immense native populations due to both

loss of knowledge and decreased adaptation to the local environment; examples are everywhere in Africa, Asia and the Americas. It should be admitted that many of these cases have been largely induced by adoption of exotic techniques and new life style of the technological societies. It is my intention to condemn this attitude and its manifestation as generally harmful and no doubt environmentally disastrous. It involves a levelling down of the indigenous possibilities of being, a covering-up of genuine response and experience by the adoption, in architecture as well as in culture generally, of fashionable mass attitudes and actions. The values are those of triviality and superficiality which have been borrowed or handed down from some external source. And the results are becoming increasingly predictable; a series of significant social and economic dilemmas brought up by complete ignorance to the local resources and natural habitat.

It is adaptation to nature and the physical environment, but not adoption of other's culture, that shapes a culture's technology and therefore its social and ideological components. The total result of the adaptive process is the production of an organised and distinct cultural entity with its integrated technology, society and ideology, which copes with the dual selective influences of nature on the one hand and the impact of outside culture on the other (M.D. Sahlins & E.R. Service 1960). It is this thesis that will repeatedly, be adopted in the various themes of this study and that will require a full demonstration of its interpretation in architecture and environmental science.

1.5.4 Disruption of Environmental Cognition (Loss of Belonging)

The expression refers to the condition where people lack a feeling of intimacy with the places they live in because the physical

and symbolic attributes of these places are unknown and cognitively chaotic, hence faced with rejection. There is evidence that this applies to today's architecture in spite of the ongoing attempts to brake this condition. It might be believed that it involves a self-conscious and reflective 'uninvolvement', an alienation from people and places, homelessness, a sense of the unreality and cruelty of the world, and of not belonging. Such perspective tends to consider the environment not as a centre of human existence but at best background to activities that are without sense, and at worst as a void (E. Relph 1976). Thus, places which people experience assume the same meaningless identity and are distinguishable only by their superficial qualities and visual images. WHEN THERE IS A LACK OF COGNITIVE RESPONSE, THERE IS A DEEP SEPARATION BETWEEN A PERSON AND HIS HABITAT (SEE CHAPTER 5). It is the cognitive satisfaction that most people experience when they are at home in their town or region or anywhere else, that is, when they possess a knowledge of places and buildings - the way they are built, the various materials and skills and even building construction employed, etc. It is certain that cognitive fitness of the built environment characterises belonging and deep and complete identity with a place that is the very foundation of the environment concept.

Paul Shepard stated that "the modern urbanite is astonished at the ability of the native . . . to move long distances in his territory without getting lost, though he may go about his city unconsciously observing clues in the same way" (P. Shepard 1967). It can be argued, then, that the differences between primitive and modern cultures are in the complexity and intensity of meaning attached to environment. Most people no longer live in a world inhabited by meanings or symbols. Harvey Cox (1968) suggests

that there are many people "who never fully recover from the loss of continuity of relationships with places" which results from urban renewal projects. But however great the need for belonging to environment may be, the possibility of its development for many people in technologically advanced cultures has been undermined by the possibility of increased spatial mobility and by a weakening of the symbolic qualities provided by modern design (E. Relph).

1.5.5 Space Deformation and Loss of Identity

In his article entitled, "Human Space in the Technological Age", D.H. Skolimowski stated that human space, resulting from interactions between physical environment and human beings, is, in our times, shaped, determined, formed and deformed by technology. While the contributions of technology to human space are quite clear, its negative consequences remain less visible. In former centuries science, technology and society were relatively separate from each other. In our times, the three are so intertwined that it is hard to discuss the problems of one without touching upon the problems of the other. Some crucial social problems have turned out to be the by-products of technological progress. With this progress more sophisticated forms are assumed, and more new relationships are created. Increasingly, technology conditions and determines our lives, such that if, in the past, man was at the mercy of his natural physical environment, his behaviour is now restricted by the artificially created environment. These observations of Dr. Skolimowski mean, in the language of the human space builder, the more technology develops, the denser becomes human space; the denser the human space, the more matrices man is involved in or is dominated by; the more matrices he is involved in, the greater is the

part of his behaviour which is determined; the more determined is his behaviour, the more acute is the feeling of the loss of identity. Thus loss of identity results from certain quantitative changes in our environment and can be traced step by step. To do this we must accept the assumption that to be a human being, man's behaviour cannot be completely determined, structured and organised. If man's behaviour is increasingly conditioned and determined by socio-technological matrices, then the scope of his natural unstructured behaviour shrinks and loss of identity follows.

I recall here Schulz's significant theme about the function of architecture. He stated that man dwells when he can orientate himself within, and identify himself with, an environment, or, in short, when he experiences the environment as meaningful. Dwelling therefore implies something more than shelter. It implies that the spaces are places, in the true sense of the word. A place, he concludes, is a space which has a distinct character or a spirit. Architecture should, therefore, mean to visualise the spirit of place, and the task of the architect is to create meaningful place, whereby he helps man to dwell or identify himself; a theme which has been greatly ignored in our modern times.

1.5.6 The Mythical 'International Style': Gigantism, Mass Values and Placelessness

One may not doubt that non-environmental attitudes in architecture tend to replace the diversity and authenticity of places with similar and meaningless buildings of the international style. These designs and mass fashions come from above to people. They are not developed and formulated by the people themselves. The movement has an homogenising influence and its manifestations all over the world seem to be the same: the destruction of local and

regional architecture and landscapes. Regretably, one may notice today the diminishing of indigenous cultures in many places, or observe cultures being affected by virtually miles and miles of highrise office and hotel buildings, discotheques, services and so on. We could easily cite many places around the Mediterranean coasts, in Southeast Asia, and South America. The landscapes as well as the architecture of this movement have been typified and deliberately directed towards outsiders, spectators, passers-by, consumers and tourists (J.B. Jackson 1970). It can suggest almost nothing of the people living in the area.

Meanwhile, various activities, facilities and fashions have been characterised by mass values and a grand scale which significantly changed the character as well as the socio-economic context of these places. While the old roads were basically extensions of a place and part of nature, the new highways do not connect places nor do they link with the surrounding landscape; they start everywhere and lead to nowhere.

Highways and speed railways, by making possible the mass movement of people, have encouraged the spread of placelessness well beyond their immediate impact, according to Relph (E. Relph 1976). Generally in many less technological cultures a profound sense of place has certainly prevailed. The depth of meaning, conformity with environmental settings, and diversity of domestic architectures are, however, greatly weakened in most present cultures. The diffusion of universal attitudes and the standardised manifestations of these attitudes in the landscape appear to be widespread and increasing in most of the industrial countries, and are, by diffusion, spreading widely in most developing countries.

However, there appears to be a persistent theme criticising

the alienating changes brought about by the application of these universal and technological attitudes in the developing countries. This theme, unfairly, has been always faced with preservation, suspicion and maybe even negativism. One reason for such a position might be, of course, because this theme has been expressed by the concerned people always emotionally rather than through solid argument. It would be questionable, however, to compare by analogy these changes with the cultural and architectural changes which occurred in Europe, for example. The European changes or styles were external variations within the same structure. They inevitably maintained their internal relationships to the basic components of the European culture. For example, in spite of the changes in appearance, they maintained the same functional performance and conformity with their physical setting as well as the economical and local technological capacities. The modern and the international styles not only ignore these basics, but also misinterpret the other components, that is, the social, historical and religious. If we could persuade those concerned people of the third world that those cultural institutions in the technologically advanced countries, which restrict the individual from painting his small window with the colour he likes, that they are committing a mistake, only then might these people look with patience to the concrete, metal, fibreglass and plastic structures of the international style scattered arbitrarily round his small (desert) village. S. Giedion wrote describing the international style:

"A kind of playboy-architecture became en vogue: an architecture treated as playboys treat life, jumping from one sensation to another and quickly bored with everything. I have no doubt that this fashion born out of an inner uncertainty will soon be obsolete, but its effects can be rather dangerous, because of the world-wide influence of the

United States . . . There is a word we should refrain from using to describe contemporary architecture - 'style'. The moment we fence architecture within a notion of 'style', we open the door to a formalistic approach. The contemporary movement is not a 'style' in the nineteenth century meaning of form characterisation. It is an approach to the life that slumbers unconsciously within all of us. In architecture the word 'style' has often been combined with the spithet 'international' though this epithet has never been accepted in Europe. The term 'international style' quickly became harmful, implying something hovering in mid-air, with no roots anywhere: cardboard architecture. Contemporary architecture worthy of the name sees its main task as the interpretation of a way of life valid for our period. There can be no question of "Death or Metamorphosis", there can only be the question of evolving a new tradition, and many signs show that this is in the doing". (S. Giedion 1976).

1.6 CONTRASTING CONCEPTS OF MODERN MOVEMENT

In this era alone, there are as many contrasting architectural styles and intellectual views as there have been in the whole history of architecture. One may suggest that this is an imperative phenomena, timely and natural in the process of the evolution of western culture. That is, the contrasting natures of the various practices and perspectives is the inevitable manifestation of prevailing technological ideologies that motivated many hidden intellectual potentialities of 'human mind'. At the other extreme of this argument we may find those who believe the contrary. The contrasting manifestation of modern architectural theories may have to be considered as a sign of the beginning of 'the architectural bankruptcy'. Its cause stems from the failure of excessive intellectualism in opposition to the clear and simple views of human adaptional endeavours in manipulating an environment least to be called 'well fit'. Moreover, for these people, this intellectualism

is a product of a cosmology which grew out of physics, mathematics and the sciences of the past and thus we have to look for alternative cosmology.

1.6.1 Intellectualism Game

C. Alexander criticised intellectualism when describing it as being full of words and words which are very very very cheap. One can participate in intellectual discussion right, left and centre and can go this way or go that way. He argued that one looks at the buildings which purport to come from a certain point of view . . . and the main thing he recognises is, that whatever the words are, whatever the intellectual argument behind it, the actual buildings are totally different. All one sees is 1) new and very fanciful language; and 2) vague reference to the history of architecture, transformed into cunning feats and quaint mannerism. Thus the game of the structuralists and the game of the post modernists (etc.) are, according to Alexander, nothing but intellectualisms which have little to do with the core of architecture (C. Alexander 1983).

As for most of these movements, a building's anticipated performance is only predicted indirectly by powerful exercise of imagination or a great deal of profound calculation, depending on the characteristics of the design under consideration. Thought provides very little representation of the building's context. The physical or climatic environment is just imagined probably in most cases only in the most general way, as is the anticipated behaviour and social backgrounds of the building's occupants. Since the process of design involves an imagined interaction between form and context, having any

physical representation of the different aspects of the functional context would clearly be arbitrary.

1.6.2 Denial of Tradition, History and Culture

The essential property which distinguishes cultural evolution is that inherited cultural information and data are passed to new generations via language and teaching. Material culture can be cumulative in a very obvious way: artefacts, tools, books, buildings, ... Cultural knowledge can be cumulative also in a rather more interesting sense, not simply historical records or scientific facts piled up, but that our understanding of events is built up out of these data and in relation to a larger structure of existing ideas (P. Steadman 1979). These data and ideas can be transformed, reinterpreted, and "revolutionised" while still based on the same inherited material which history and tradition provide.

It is rather ironic to compare cultural evolution with the organic evolution in which inherited information is obtained via the body of the organism rather than outside of it. In such a case the whole body of traditional knowledge and the historical accumulation of man-made products - precisely what constitutes culture, tends like the human designer himself, to disappear. Some modern design concepts involve a strange denial of the very fact of culture by the denial of tradition. For example, a modern group (the Purists) were interested in the primary qualities of pure geometry which could serve, as they believed, to provide a visual language that would transcend particular cultures and would require no historical or cultural prior knowledge. Such expressionist theory, no doubt, had considerable impact on modern architecture especially because of the abstract and non-presentational nature of architectural forms and their composition. The

functionalism of the modern movement taught that the meaning of a building and its component elements would be no more and no less than a demonstration of the social and utilitarian functions served. The building simply meant what it was; it would convey an explanation of its nature and purpose through its open legibility even though its forms would be completely unfamiliar and without precedent. Due to the modern movement's anxiety to sever its connections with the styles and in particular to escape from the language of classicism, it was equally anxious to escape from an acknowledgment that the communication of meaning in architecture might be dependent on evolved codes which were the product of convention, of time and of the general public experience of buildings of the past. There is a second way in which culture tends to vanish from view in the modern movement: the picture which offers the relationship of man to the natural environment. With the rejection of historical styles and traditional forms in architecture, attention was directed towards new considerations of basic utilitarian functions of buildings: control of climate, the meeting of biological needs, materials and engineering problems. It was from the capacities of these materials and practical functions of buildings that the forms of the new architecture were to be derived.

C. Alexander criticises those architects who are reluctant to use traditional architectural elements and forms. He declares, "so, the question is, why not, why does this taboo exist, what is this funny business about having to prove you are a modern architect and having to do something other than a pitched roof?" The simplest answer, he believes, is that the architect is obliged to do something else, something more far out, otherwise, people will think he is a simpleton. The crucial explanation actually is that,

the pitched roof has a very primitive power of feeling which reaches into a very vulnerable part of the human being. But the version that is okay among the "architectural fraternity" is the one which does not have feeling - the roof is a simple example. The belief is that the history of architecture in the last few decades has been one of specifically and repeatedly trying to avoid any primitive feeling whatsoever. Why was that?

1.6.3 Inhumanistic Cosmology

To answer the above question the modern theory would reply that these traditional forms (e.g. pitched roof in the above example), are extensions of the vertebrate structure which sheltered and enclosed man. But when man started to study man, there was a displacement of man from the centre. The presentation of the fact that man was no longer the centre of the world, no longer the arbiter, and therefore no longer controlling artifacts, was reflected in a change from the vertebrate centre type of structure to the centre-as-void. The alienation, or lack of feeling, may have been merely a natural product of this new cosmology (P. Eisenman 1983). What modernism was attempting to explain by its form was that alienation. And as technology has gone rampant, it may be that we need to re-think the cosmology. Modernism is not convinced that we can go back to anthropocentrism.

In my opinion it is this notion, the separation of man from the universe, from his surroundings, which modernism adopted, that explicitly extended development of buildings exotic to their context and exhibits little concern for human affairs and values.

Indeed until the seventeenth century, man and the universe were seen by most cultures as more or less intertwined and inseparable.

That is, the constitution of the universe may be such that the human self and the substances out of which things are made, the spatial matter, are much more inextricably related than we realised and if one talks about an order it is ultimately and fundamentally an order produced by centres or wholes, which are reinforcing each other and creating each other (C. Alexander 1983).

1.6.4 The Scientific Analogy

Architectural theorists of the modern movement admired the engineering works. They considered them scientific, hence they gain their originality and power on this basis. They were victims of the so-called "inductive fallacy". Karl Popper, in the *Objective Knowledge*, 1972, argued that, from simple observations of the facts of nature a law will emerge which will impose itself on the scientific observer. What happens is that the observer, instead of remaining passive, will himself impose hypotheses to explain the phenomena and test them to see whether these hypotheses fit. This will demand new observations according to which the hypothesis may be modified. The origin of the hypothesis is in the whole body of relevant knowledge which constitutes that science which has been developed. In all cases hypotheses are framed, hence, in relation to a prior knowledge the observer possesses. In employing this procedure in choosing architectural form according to a set of data of requirements, C. Alexander pointed out that both processes, the creation of scientific hypotheses and architectural form, demand invention of some kind and are not logically abductive. He suggested that data alone is not enough to define the hypothesis and that additional requirements are only some organising principles of clarity and simplicity.

When during the sixties, a similar approach was attempted, data were collected and assembled into the "programme"; meanwhile all premature urges to define the form and shape of the building were suppressed. Then, through an analysis of this programme, the designer was encouraged to determine what form the logic of his analysis must produce; he had to find out what the building wanted to be. In this climate the notion of the value of an inherited body of understanding about buildings, and of the absolute necessity for design hypothesis to be based precisely on "preconceptions" of some kind, were obviously not likely to find much support. What usually happens in such cases is that the design always imposes some hypothesis which, like the scientific hypothesis, must again have its origin largely in the body of collective knowledge which designers possess about existing and past artefacts and their behaviour and properties.

1.6.5 Summary

As a matter of fact, within the specific area of environmental and architectural studies, there exist, today, a huge number of contrasting, confusing and diffusing sets of theories within which it becomes impossible to resolve, separate and diagnose the various elements of the study. Therefore it is becoming quite imperative for any design research to imply a refusal, rejection and suspicion towards these abstract perspectives and become aware of their socio-economic and political implications on the various societies and the blocked up enterprises to which they inevitably lead (M. Kaddache 1986).



FIGURE 1
University of Qatar:
Imitation of the
compactness is
achieved by geometrical
buildings of exotic
materials.



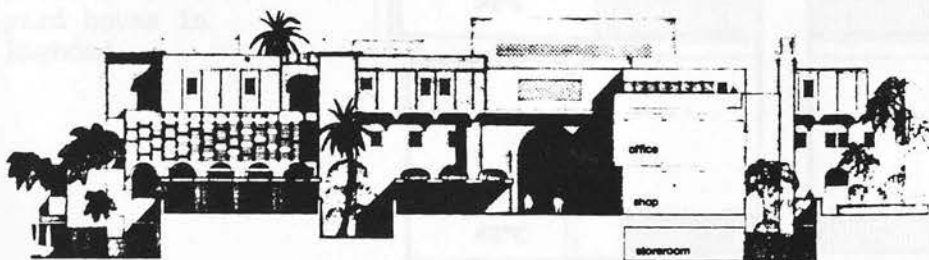
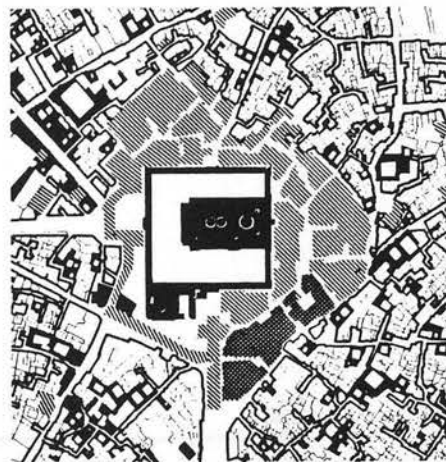
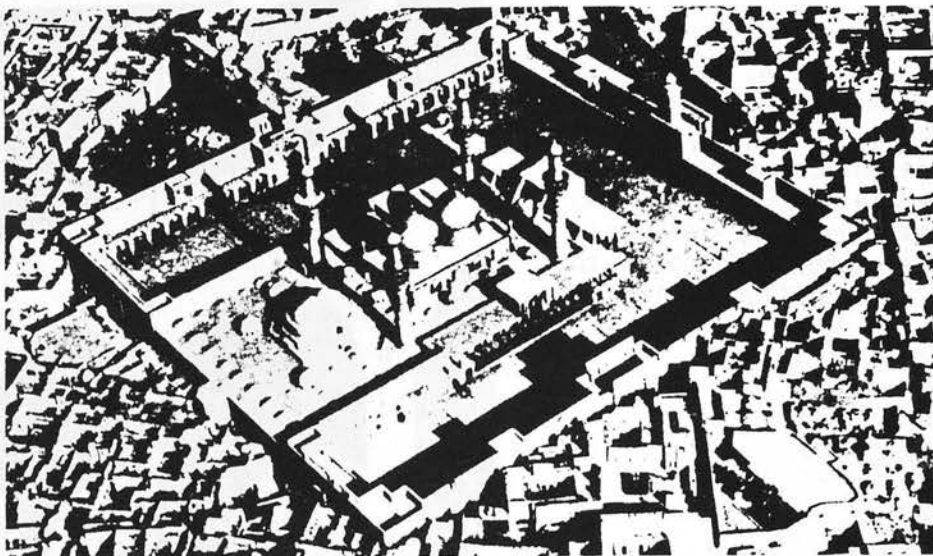
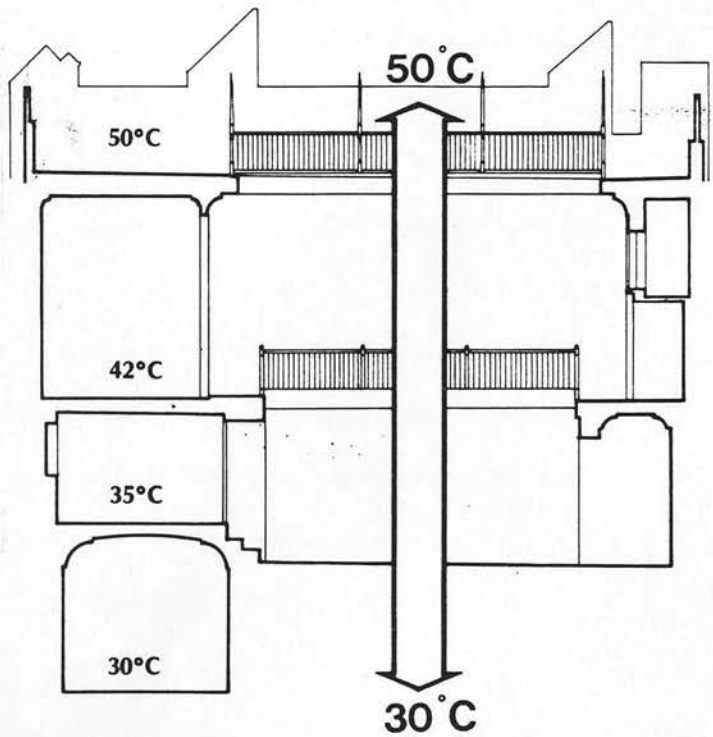


FIGURE 2 Kadhimiyeh - Baghdad. Vast conservation area has been replaced by a scheme of heavy concrete structures, extremely difficult to build by people. They emulate superficially the traditional patterns, but do not cope with climatic and other environmental circumstances.



FIGURE 3 The passion for the traditional elements has introduced us to 'Artificiality' which characterises many modern buildings. Here, 'plenty' of arches built by concrete, the structural qualities of which can produce any shape or form in a building.

FIGURE 4 Climatic performance of a Courtyard house in Baghdad.



Chapter Two

TOWARDS ECO-CULTURAL COSMOLOGY

5.1 INTRODUCTION

TOWARDS ECO-CULTURAL

COSMOLOGY

The Study Theoretical Framework

TOWARDS ECO-CULTURAL COSMOLOGY

2.1 INTRODUCTION

Some architectural theorists suggested that the era of anthropocentrism had passed, giving way for a new era of technocentric cosmology to take place, to grow up, and to flourish in our societies. They also restated that, due to some historical necessities, we ought to look for a new alternative. Technocentrism, it is stated, has gone far, expressing sciences of the past (Eisenman 1983). I take the opportunity to suggest here that the time is due to free our architectural thoughts and ourselves from subjectivity and 'restraints' of all cosmologies. Instead, we accept that we should remain residing and sheltered in the eternally safer domain of nature. I do not mean we should live in the forests, fields or mountains, but in buildings that tell the story of our commitment to nature. That is, in the interest of seeking a longer and clearer cultural future, we ought to build an intellectuality that maintains a strong and clear affinity with nature, and is deeply rooted in her.

In view of these observations and the previous analysis presented in Chapter one, I introduce in this chapter a general framework which will aim to demonstrate how architectural and environmental concerns ought to be orientated in order to meet the requirements of such an eco/cultural attitude.

2.2 ECOLOGICAL ORIGINS

When tracing the origins of some values attached to the visual qualities and use of physical objects, as well as the origins of people's various preferences and beliefs, one is struck by their relation to nature and ecological settings in the first place. For example, at first glance into an arid land, we will be attracted by a lack of the colour green. It is possible that people as a result associate this colour with holiness and dedicate it to particular religious and ritual uses. Furthermore, a lack of certain materials in the same region such as stone, metal or even wood will condition their use and also gain them some peculiar social significance. As we move a bit further dealing similarly with more objects, both latent and manifest human aspects, we come to the conclusion that societies inhabiting different geographies have developed distinctive patterns of life and formed cultural contexts which embody the natural characteristics of their habitat.

The art of cooking is an example. Here we have basic and long-term styles of food preparation characteristic of vast areas, and sometimes associated with great societies. In eastern Asia, for instance, food is prepared soft; boiled rice, meat and vegetables cut into bits in the kitchen not at the dining table, hence a tendency to combine several foods into one prepared dish (A.L. Kroeber 1957). The origin of this specialised cooking may possibly have been due to certain properties of available materials such as rice. However, habits applied to the preparation of food, their service, accompaniments and utensils differ among various geographical areas. Within these areas well-marked national styles of cuisine arose basically dependant on availability of certain materials.

There are several indigenous considerations behind the characteristics of the national dress, fashion and textile making. On one hand, these are basically linked to the kind of natural fibres produced in the area. On the other, they are also determined by people's interpretation and ideas of nature as well as the prevailing climatic and topographical conditions.

The fine arts vary from one another in the degree to which they represent or depict - as their products have a factual meaning or tell a story. Many arts for both ear and eye have in their beginnings served spirituality, highly represented human fears and/or respect of natural phenomena, i.e. lightening, rain, etc. It is universally conceived that folk arts achieve values, and these values continue to reside in products that receive their inspiration and thoughts highly integrated with their natural habitat. For example, ceremonial dances of the traditional societies were primarily to celebrate natural events such as succession of seasons, rain, harvest, natural hazards, and so on. We can talk similarly about painting, sculpture, music and ceramics. On many occasions, their characteristics are mainly attributable to the kind of available materials from which they are made such as animal skins, certain kinds of wood, stone, natural colours, etc. If arts, artefacts and lifestyle are thought to be describing people's commitment to their physical environment, architecture should, in the first place, encompass this commitment. That is, different building forms; the provision of usable space, and its relation to site area occupied, the retention or loss of heat, the circulation of the occupants, etc. are all found to be associated with the physical conditions.

The separate functional elements or individual spaces of buildings, by similar argument, would have their typical forms; and equally in the field of the applied arts, all kinds of tools,

implements, domestic utensils and the like would also have their characteristic shapes, suitable for their individual purposes. In biology, it has been suggested that the coordination of the internal parts of the body were seen to be associated with the external conditions or environment of the animal (Cuvier 1813). Animals living in water, sea or air would have appropriate organs of locomotion. By evidence, the separate organs of the body can be said to serve definite functions, and these functions are related directly or indirectly to the nature of the creature's environment - fins for swimming, certain kinds of teeth for eating meat or grass, and so on. Here is a clear ecological basis familiar in the literature of functionalism and in the modern movement: in both animals and artefacts, form is related to function, and function is related to environment. The degree to which form suits or is appropriate to function and environment in either case might be expressed in terms of 'adaptation' or in terms of 'fitness' (P. Steadman 1979). The argument here is that every detail of organic form has its functional purpose - even the colours of plants and flowers which serve to attract and guide pollinating insects, or the colouring of animals for the purposes of disguise or aggressive appearance.

WE MAY ARRIVE AT SOUND PRINCIPLES IN BUILDING DESIGN BY STUDYING THE PRINCIPLES OF ADAPTATION IN NATURE. This will entail a study of the climate to which a building will be exposed, of the site for which it is intended, of the nature of the activity which it houses, and of the varied wants of the building's users. Hence it is argued that building forms must be adapted in an equivalent way to the environment in which they are situated, through the skill of the Designer or the Builder. Bernard Rudofsky wrote, describing the builders of anonymous and vernacular buildings before architecture

became a specialised profession, that the Builders "demonstrate an admirable talent for fitting their buildings into the natural surroundings. Instead of trying to 'conquer' nature, as we tend to do, they welcome the vagaries of climate and the challenge of topography. Whereas we find flat, featureless country most to our liking, more sophisticated people are attracted by rugged country". Rudofsky continued, "the beauty of this architecture has long been dismissed as accidental, but today we should be able to recognise it as the result of rare good sense in the handling of practical problems. The shapes of houses, sometimes transmitted through a hundred generations, seem eternally valid, like those of their tools" (B. Rudofsky 1964).

THEREFORE, IT IS RATHER A MATTER OF INTELLECTUAL ENJOYMENT TO APPROACH ARCHITECTURAL ESSENCE THROUGH ITS EXPRESSIVE FEATURES. ARCHITECTURE IS NOT AN EXPRESSIVISTIC ACTIVITY. IT REPRESENTS ITSELF IN ITS BELONGING AND ADAPTATION TO ITS SPECIFIC ECOLOGY.

2.3 ARCHITECTURE IS NOT AN EXPRESSIVE MEDIUM

A notion has been firmly rejected in my study which approaches architecture through theories and self-expressive means. Architecture is not an activity of personal expressions. That is, arts, i.e. painting, sculpture, music, etc. acquire much of their expressive character from the personal manner in which we may approach them, from the ability of such arts to address themselves to a specific and perhaps highly specialised audience. On the contrary, the expressive features of architecture are not, and cannot be, of this PRIVATE kind. If an architect changes public taste it is only when he addresses himself to the whole public and not merely to some educated public.

Buildings are places where human beings live, work, learn and worship, and certain forms are imposed from the beginning by the needs and desires which a building is designed to fulfill. Unlike, perhaps, a piece of art, the value of a building is determined by the extent to which it fulfills its function and not by purely aesthetic considerations. In other words, one may suggest that the functional qualities and utility of a building are its essence; they are not accidental properties and thus define the designer's task, which is far from being the expression of feelings or self-expressive thoughts (R. Scruton 1979). For expression is part of the realisation of inner life, making intelligible what is otherwise ineffable and confused (G.R. Lefrancois 1980). In this sense it would be a great distortion to consider that architecture is an expressive medium in just the way that sculpture, for instance, might be.

Architecture is far beyond being seen in the way we might see art, as an expressive activity, deriving its nature and values from a peculiarly artistic aim. In the expressive arts, there can be no rules or procedures such as that followed by a builder with a clear end in view and clear means to fulfill. A builder has to fit his work into some pre-existing arrangements of unchangeable norms, being constrained at every step by influences which forbid him the luxury of a self-expressive aim. Architecture, then, is simply one application of that sense of what 'fits' which governs every aspect of daily existence (R. Scruton 1979).

Because a building is essentially a public object, it is looked at, lived in and perceived at all times. The observer is not normally putting himself in a special frame of mind when he passes or even when he enters a building, nor does he regard it as an object of private and personal attention. This might explain

the difficulty people undergo in responding to buildings such as the new Lloyds Bank, Pompidou Centre, Ronchamp Chapel and so on. Furthermore, we may not think that, if we are to understand a building, we must be able to name or describe the character that is presented by it or the philosophy behind it. If there is knowledge involved, it is a sudden familiarity with something to which one may be reluctant to attach a name or attribute to a particular concept or theory (See Chapter five). Roger Scruton suggested that the aesthetic understanding is a practical matter; it consists not in theoretical knowledge, but in the organisation of perception and feeling. Hence architecture should not be understood in terms of expressive or representational values. For representation, being the expression of thought which might be wrong or right, contains an essentially narrative element, an elaboration of a story to describe a subject. But the building does not so much describe a subject as profit from it: it profits from our prior familiarity with a certain form in order to render itself intelligible to the human eye.

In view of this very notion, we study and examine the practices and policies of the design disciplines of Planning, Urban Design and Architecture. That is, because of their expressive nature, these disciplines have seriously implied many harmful and unharmonious approaches that ought to be fully reconsidered.

2.4 CONCEPTUALISTIC VIEWS OF PLANNING, URBAN DESIGN AND ARCHITECTURE

A widely spread tradition held by today's academics and practitioners divides the design activity into segmented practices. To most of us, design is fragmented into Urban Design, Architecture, Landscape Design, City Design, Planning and so on. It would be fairly acceptable if this classification were to merely indicate

various scales of concern areas. For example, it has been suggested that Urban Design is concerned with the physical form of the public realm over a limited physical area of the city. Therefore, Urban Design lies between two well-established design scales of architecture, which is concerned with the physical form of the private realm of the building, and Town and Regional Planning, which is concerned with the organisation of the public realm in its wider context (D. Gosling & B. Maitland 1984). The inadequacy of such classification lies in the immediate difficulty of distinguishing and defining problems associated with each of these fields. Obviously, there is an overwhelming overlap of aspects that are certainly present in the various scales. Within each discipline, a concern has been specifically concentrated on and more often looked at as being more relevant to the design in hand. Moreover, at first sight of the different products of these disciplines, it would appear as if they embodied perhaps contrasting notions or implied conflicting and disintegrated principles of design. A feasible explanation for this might be that those concerned designers either have not developed a knowledge of such principles in the first place, or they have disputable approaches to them. However, one cannot deny that such a situation has led to harmful effects on our architectural environments. For example, there is an unquestionable view that planning methods over the last three decades have failed to produce a satisfactory physical environment (D. Gosling & B. Maitland 1984). These methods have resulted in a proliferation of land-use plans, traffic studies and economic and demographic surveys, while more recently, sophisticated computer-modeling techniques have been used to optimise the land-use matrix. But all this has little to do with the way in which city people actually perceive, use and enjoy their environment. It has

become apparent in recent years that the physical development of world cities has been going wrong and there seems to be considerable uncertainty as to what the logical priorities should be.

Within the discipline of Urban Design, one of the aspects which has been associated with the city is the economic issue. It has been considered that all of the problems of the city can be solved by sufficient application of finance (D. Gosling & B. Maitland 1984). Such a view not only explicitly ignores the other values out of which a city's structure is built, but tends to consider the city as a physical representation of mere economic forces. Another example of solving problems presented within the Urban Design context which also raised criticism is the engineering approach. The scale and speed of works in densely built-up areas provoke reactions familiar from modern urban motorway programmes: many houses are to be torn down, the imposition of rigid traffic engineering standards which usually result in a lack of safety for pedestrians, undeveloped lands, and undesirable housing conditions. Jane Jacobs describes projects of planning. She writes,

"low-income projects that become worse centres of delinquency, vandalism, and general social hopelessness than the slums they were supposed to replace; middle-income housing projects which are truly marvels of dullness and regimentation; sealed against any buoyancy or vitality of city life; luxury housing projects that mitigate their inanity, or try to, with a vapid vulgarity; cultural centres that are unable to support a good bookstore; civic centres that are avoided by everyone but bums, who have fewer choices of loitering place than others; commercial centres that are lacklustre imitations of standardised suburban chain-store shopping; promenades that go from no place to nowhere and have no promenaders; expressways that eviscerate great cities".

She describes this as the sacking of cities, but not the rebuilding of them (J. Jacobs 1964).

Generally this discussion suggests that the city is an extremely complicated phenomenon whose problems interact in complex ways; that

there is often fundamental disagreement about the nature of these problems, and that the "whole picture is continually undergoing changes". David Gosling and Barry Maitland suggested that we might observe a remarkable contrast between this complexity and the many examples of what is offered as the solution, which is characteristically simple, ambiguous and static (D. Gosling & B. Maitland 1984). It may be that these solutions do so clarify and resolve the conflicts of existing cities that a lucid and inevitable simplicity is achieved. It might be, alternatively, suggested that the simplicity is achieved in spite of the nature of the problem. Some critics have suggested that the difficulty and urgency of urban problems have produced correspondingly exaggerated simple, sweeping, once-and-for-all responses, and have in turn compounded the problems. A curious reservation of the simplest solutions for the most complex problems is a long-standing characteristic of much urban planning, and forms one basis of contemporary criticism of its results. A more fundamental critique of attempts to simplify the problem has been presented by Christopher Alexander. He argued in 'A City is not a Tree' that such attempts were based upon a mistaken appreciation of the structural relationship of the city's elements which typically take the form of semi-lattices. The tree-like structure of most modern plans represents a trivially simple case of the semi-lattice structure, and one in which 'life will be cut into pieces'. A similar argument has attacked institutional methods of solving problems which leads inevitably to a challenge to the planners, whose role may be seen either as superficial or sinister (R. Goodman 1972). Goodman argues that the language of aesthetic ideology acts as a smoke-screen, an elaborate euphemism for the imposition of political ideology, while planning tools such as zoning regulations are used to enforce the status quo. Such criticisms have obliged Urban

Designers to re-examine their relationship with the problems of the city and to admit the possibility that they are themselves an urban phenomenon and hence a part of the problem as much as the solution.

Within the history of Urban Design concepts, we observe the various attempts for proposals for ideal cities which were based on entirely different principles. But most of these cities proposed to support an idealised social environment were utopias, i.e. they most frequently sought a social ideal that was impracticable. An exception to this notion may be Ebenezer Howard's proposal for a garden city. The famous Radiant City of Le Corbusier and those of Frank Lloyd Wright for an idealised suburban or agrarian city, were based on significant social concepts of urban life (Le Corbusier 1967; F.L. Wright 1958). Both concepts combine a social and physical ideal. That is, they follow the belief that the physical environment can have a positive impact on the social environment of the city through the creation of an appropriate physical environment. (There is a growing belief that a particular design will not guarantee that a specific behaviour will occur.) On the other hand, aesthetic principles were also sought in many important works of Urban Design. In 1889 Camillo Sitte challenged the very ordered and formal planning of the period and tried to point out the intrinsic artistic qualities of the more complex and less formal urban landscape of the Medieval period (C. Sitte 1965). Le Corbusier argued for the replacement of the fussy eclectic designs of the beginning of the century with designs that were simple and straightforward. Robert Venturi has argued for the creation of environments that are more complex and full of surprises (R. Venturi 1977). We may notice that each of these concepts raise important aesthetic issues which are related

to fundamental human aesthetic drives. But we can criticise these concepts in their looking for a formal language of aesthetic which does not identify urban aesthetic experience in its proper context. In other words, the problem for the designer is to make the correct choice for a given situation. That choice is likely to vary with the context. It is most likely to be found in the immediate context rather than following a particular general view. Therefore we may have to dismiss the notion that there is one correct aesthetic and hence have to look for it within each context.

One major concern of Urban Design in the sixties was the study of perception and the city image as a principle of achieving an environment of better quality. Lynch's early research explored the concept of image, the interaction between physical form and people's perception of that form (K. Lynch 1967). He was essentially interested in those aspects of the visual character of a city which influence mental perception of the environment. In his research, Venturi and his group concluded that the strip environment has many of the design qualities so often admired in historical architecture of Urban Design - changes in scale, symbolism, ambiguity, and decorative embellishments that have meaning.

It is not the intention to prepare a survey of the recent and present approaches and concepts of Design. But it might be inferred that as a result of these various studies, designers of today have been repeatedly reconsidering their preconceptions about architectural form and symbolism taught by the followers of the modern movement in design. It appears clearly that the major issues in design tend to focus on the relation between self-conscious conceptual and un-self-conscious design approaches. The first are mostly associated with those designers of the modern movement who

felt the need to give expression to the new opportunities offered by the automobile, new construction technologies, and an unprecedented need for new building forms. In doing so they forgot many of the virtues of older forms. It was not long, however, before critics called attention to the problematic nature of some of the new approaches and their irrelevancy, especially the phenomenon of isolating the individual buildings from their environments.

The architects of our present time are primarily and solely focusing upon the form and design of their individual buildings. They have rarely attempted to integrate the buildings to their indigenous environments. In so many instances, quite masterly designed pieces of architecture, most striking and beautiful, appear to us extremely odd, so unintegrated and out of context for that very reason. They seem to lack both meaning and identity, and hence are associated with ignorance and anonymity. In contrast, a quite modest building situated in a remote corner of town tends to attract our attention and arouse genuine and beautiful sensations. It successfully represents its physical and cultural context and hence is associated with importance and fame (FIGURE 5). We expect the architect to build in accordance with a sense of place, and not to design his building - as many a modern building is designed - so that it could be placed just anywhere. It is true that the architectural 'instinct' can show itself even in the dwellings of nomadic tribes, but the impulse to which we owe most of the fine architecture that we have inherited is an impulse founded in the sense of place.

It would be of little practical use to investigate any further into the effects of the various inharmonious ideas of the three disciplines. It would be more significant to denounce and reject such a fragmented approach to design principles in the first

place. Even more acceptable is that the development of design disciplines were, initially, to deal with inconveniences unavoidably projected during the economical and industrial developments of the recent past. For instance, for quite some time over-population, immigration, rapid urbanisation and inefficient management or increasing and unbalanced exploitation of resources, etc. were quite unfamiliar conditions. Not only were they brought about by emerging economical structures but were also associated with chaotic ideologies which these structures introduced. On the other hand, it might seem possible that many 'urban problems' have occurred in various domains and have involved more than one aspect. It is natural, then, that as a result they opened up the opportunity for specialised concerns to take place and to develop into independent disciplines later on. I will be arguing that to avoid any aggravated situations of our urban life, and to achieve more 'fit' and more compatible environments, might not necessarily mean deepening the distances between Planning, Urban Design and Architecture. What is more appealing is the reconsidering of all philosophies behind present economic/technological strategies and their ramifications. Moreover, it is only just beginning to be appreciated how questionable may be those hypotheses which view man-environment according to very closed perspectives. Man-environment manifestations, e.g. built form and local technologies, ought to be distinguished by reference to their practical resources. In any case, they will appear interrupted only when they are determined by some kind of abstract and universal themes.

If there is substance in this latter notion, it is in the potential capacities provided and maintained by nature; its laws and the eco-systems (See Article 7.5). One example of such disturbances is provided by the big industrial and commercial

cities. The abundance of certain natural resources and potential, coupled with a relatively compatible size of population, is always largely threatened by flow of excessive population seeking work or a more prosperous future. In the majority of such cases the largest percentage of people are usually engaged in peripheral and secondary nonproductive activities. They range from service works to minor businesses, which are far beyond the need of the authentic 'population'. Though often very dramatic, the resulting situation is simply a frustrating series of congestions, social decline, depersonalisation, chaotic architectural practices, cheap housing, inconvenient living conditions and so on. Until some time ago these presently familiar conditions were on a small and relatively limited scale, and uncontrollable. But they were the beginning of one kind of monstrous blight which hits every populated place on earth in the present age. It submitted vast areas of agricultural lands to inevitable death and starvation. By accepting such 'strategies', it seems that we tend to commit our societies to problematic situations in order to generate wealth which a balance between population and natural resources would give automatically and without such an environmental price. My argument is that if there were a real threat it would not be from an increase in the world's population but from its unequal distribution (See Article 11.3).

All this seems to raise a question about whether Urban Design and Planning methods have, in fact, provided the real remedy, whether they are capable of giving fundamental answers to ever accumulating consequences. These two disputable but crucial questions have led my investigations to another vital conclusion. That is, it might be beyond 'planners' and 'designers' capabilities to elaborate more and more sets of proper theories and hypotheses. Firstly, these hypotheses seem to burden our undetermined behaviour

and also condition our choices which are thought to be free and human. And secondly, in order to ease urban congestion, the planners of today exert more and further efforts to avoid unpredictable side effects of their methods. In this instance we are, I suggest, going in the wrong direction. In the first place, a sharp change, though dramatic, is required. We are in a position to induce entirely fresher and stronger attitudes to nature and technology; seemingly the two most influential elements in modern man's life. It is an attitude whose fundamental drives are more orientated towards man, his nature, and his peculiar ecology rather than towards uncertain methods and hypotheses.

2.5 HOLISTIC PRINCIPLES OF DESIGN

We are aiming at an adaptive form of design. For instance, vernacular architecture, which may also be called traditional, anonymous, folk or pre-industrial, was an adaptive kind of human achievement. Its forms have always been the dominant in any era, as opposed to the expressionistic products of the monumental, high style and formal architectures. The traditional forms, whether building types, spatial organisation, physical structure, activity patterns or other social/cultural manifestations, were set up compatibly. They hardly implied any disruption and harm, nor did they cause any problem. A form of this type is an extension of man and environment. Architecture is man, and man is environment (See Article 3.7). Therefore man, architecture and environment form one whole, and imply identical structuring principles. An environmental phenomenon, whether a single building, activity or any of their aspects, is totally immersed in the whole web and hence what applies to it applies similarly to the other elements of this whole. In

other words, the same principles ought to be sought for when designing a piece of furniture, a single house or a whole town. This will inevitably influence choices of materials and forms; the thermal, functional and physical performance and also buildings' articulation and aesthetical capacities all of which conform to the eco/cultural context of their inhabitants. Lewis Mumford stated that "the buildings speak and act, no less than the people who inhabit them; and through the physical structure of the city, past events, decisions made long ago, values formulated and achieved remain alive and exert an influence (L. Mumford 1961).

The different scales of design should not, then, under any circumstances imply even slightly different approaches. We have noticed in brief some consequences of the inharmonious approaches of design disciplines in which their areas of concern seemed to be totally disintegrated or hardly related, because of the application of differing principles of design. It would be more useful to cite some examples. We may observe that patterns of movement and spatial structures in a vernacular town are primarily determined by and oriented towards points of ecological importance, i.e. economical, natural and geographical such as farms, mines, link roads to other towns and so on. They are also shaped internally to conform with a hierarchy of places of activity varying from the most common (e.g. market places) to the most private places (See FIGURE 6). They therefore acquired their 'meaningful' and peculiar characteristics which include, as well as visual and physical structures, the social implications, cultural values and other environmental aspects all of which constitute the town's highly achieved and strongly perceived image. In contrast, we may observe that movement patterns and spatial structures of most of the modern developments are 'thought to be' highly segregated, meaningless and

unintelligible, thus poorly perceived (B. Hillier 1983). It might be, accordingly, that they are mostly 'drawn', not to conform with any ecological determinants, but according to some mere abstract and visual considerations. As one may expect, the result is not that only their visual characters would tend to be chaotic or weak but in most cases they would imply many social and environmental problems. These problems vary from lack of social interaction and activities, lack of security, crimes, psychological depression, misorientation, lack of identity, mis-belonging and so on. Just one example clearly provides us with an important clue, that is, it is quite trivial to divorce any aspect from its conclusive 'existential' relations as part of the whole of the environmental structure. However, to conclude any appropriate design finding at any scale, we ought to start our investigation from the whole reaching to the individual design issue, but not the contrary.

2.5.1 Conclusion

It is appropriate at this stage to look for different and fresher understanding of holistic principles underlying the 'adaptive' design. Also important is to divorce such methodologies, which imply abstract and misintegrated principles of the various disciplines of Planning, Urban Design and Architecture. It is my intention in this study to introduce such an undertaking which is essentially based on the notion of architectural adaptation to the ecological and cultural backgrounds of various societies in the first place. In the remainder of this chapter I will introduce the major characteristics of the 'Eco/cultural Architecture', leaving the demonstrations of its various aspects to take place in the following chapters.

2.6 ECOLOGY, CULTURE AND COGNITION

Beyond the physical factors which I have referred to many times, we come to what are clearly highly important, though rather indeterminate and more 'abstract', environmental components. It is the cultural environment in which the requirements for the architectural form are created, to serve activities and tastes; and where limits are placed on the possible choices of materials and time in its production. Without the cultural context there would be no functions for the designed object in the first place (P. Steadman 1979).

Philip Steadman stated that everyone will agree that a building should stand upright and keep out the rain. Because such functional requirements are so generally accepted, the impression is sustained that they are objectively determinable, that they meet certain universal or biological human needs, and are not the subject of culturally and individually variable choices. Certainly it will be progressively more difficult to preserve this impression the further the 'function' or aspects of the 'functional environment' considered move away from the strictly practical, and towards the decorative, expressive or symbolic. Hence one suggests that design problems which stem from limitations of function and materials are not always objectively determined in the first place, but are created by cultural values and human purposes. These purposes may be changed at will by people; the decision to meet any problem by an efficient solution is itself a matter of cultural choice - not imposed by any absolute external or inevitable factors.

Assuming that this is universally acceptable, the question has always been about the means by which a designer is practically capable of distinguishing, understanding and eventually interpreting the mainly abstract manifestations of cultural values and human

purposes in his physical design. So far we are all aware of such difficulties facing all high style designers in particular, and that most designers have failed in reality to do so, in spite of the various 'advanced' techniques and methodologies they created for themselves. To provide an answer to this extremely vital issue, a new view of cognition has been introduced to examine and explore cognition's role in communicating, reflecting and finally employing the cultural values in design. In other words, cognitive structure here represents a kind of familiarity that is part of a knowledge of the authentic and most natural properties and systems of objects and elements, including man, and hence inherited biologically. The role of cognition is evident in the way it influences people's unself-conscious choices of objects and built environments and other artefacts. On the other hand cognitive choices could hardly be expressed verbally or by written decisions. It could be understood through analysis and observation which traces people's creations of artefacts and also more importantly building forms. Therefore the central idea that the three elements of ecology, culture and cognition communicate is as follows: Human beings adapted to the physical environment (more broadly, ECOLOGY; See Chapter 3). They elaborated sets of values, norms, beliefs and styles, in short, CULTURE - to support and hence mark their cultural adaptation to ecology. Activities which people experience, one of which is Design, were facilitated by inherited knowledge - COGNITION - of objects and systems which their ecology possesses and which are essentially characterised by authentic and permanent properties such as those concerning structure, strength, thermal capacities, vision, ecosystems, time rhythm, and so on. Therefore, further detailed studies of ecology, culture, cognition, adaptation and relevant subjects will be respectively introduced in the following chapters.

At this point, I have introduced the notion that design activity involves adaptive rather than expressive aims and that what underlies this adaptive process is a set of holistic principles which act on the various scales and levels of the domain which I describe as being essentially an interplay between three elements: ecology, culture and cognition. Here I will demonstrate the main attitudes this process tends to imply which sustains its continuity and success across history. This attitude has been well studied and is introduced within the movement of the new environmentalism.

2.7 ENVIRONMENTAL VIEW OF CULTURE

In opposition to the previous non-environmental views of culture, i.e. holistic, the historical and the closed system, here is a view which attempts to relate culture to the physical environmental settings in which particular groups of people develop their distinctive lifestyle. This approach emphasises the role of physical environmental factors in shaping, limiting or determining various forms of group-shared behaviour and regularities which lie behind it. This view, and specifically its version of the so-called cultural ecology, is adopted in this study for reasons that will be demonstrated in the various parts of the work.

2.8 ECOCENTRISM

Ecocentrism contradicts other contemporary technocentrist ideologies already presented in Chapter 1 as one responsible factor which leads to many environmental problems in our present time. The ecocentric mode, in contrast, has been described as "resting upon the supposition of a natural order in which all things moved according to natural law, in which the most delicate

and perfect balance was maintained up to the point at which man entered with all his ignorance and presumption" (McConnell 1965). Thus the web of life was broken by a degenerative succession of disturbed harmonies leading ultimately to the destruction of man himself. Ecocentrism preaches the virtues of reverence, humility, responsibility, and care; it argues for low impact technology (but is not antitechnological); it decries bigness and impersonality in all forms, especially in the city; and demands a code of behaviour that seeks permanence and stability based upon ecological principles of diversity and homeostasis (T.O. Riordan 1976). Ecocentrism is concerned with ends and the proper kind of means, whereas we saw that technocentrism focuses more on means themselves.

We do, however, have to avoid dividing the world neatly into an ecocentric camp of people who are concerned with environment, and a technocentric camp of manipulative professionals. In real life the boundaries are much more blurred. Each one of us, T.O. Riordan declares, favours certain elements of both modes. The professionals are not insensitive to the beauties of nature, nor are they unaware of the consequences of tampering with ecosystems. They differ from ecocentrists in the degree of responsibility their job demands of them and in the extent to which a 'natural morality' guides their actions.

The ecocentric philosophy provides a powerfully credible account of the relationship between nature and society, an interpretation that straddles the fierce individualism (freedom without equality) of the frontier and bland homogeneity (equality without freedom) of the agrarian landscape and the suburb (T.O. Riordan 1976). The ecocentrism seeks to blend these two images through the symbol of nature. Nature enjoys its own morality which, when

understood, could lead the sympathetic and responsive human being to a new spiritual awareness of his own potential, his obligations to others, and his responsibilities to the life-supporting processes of his natural surroundings. The power of the ecocentrism lies not so much in its naturalism as in its intense social morality about democracy, truth, beauty, and respect for nature.

Two themes inspired by philosophies of the naturalist and the natural moralist are adopted in this study and thought to be the inevitable manifestations of the adaptive (eco/cultural) architecture or lead to them.

2.9 BIOETHIC THEME

Supporters of the Bioethic line of reasoning seek to protect the integrity of the natural ecosystem (See Article 7.5), not simply for the pleasure of man but as a biotic right. Nature, they contend, contains its own purpose which should be respected as a matter of ethical principle. Natural architecture has a grandeur which both humbles and ennobles man, and stimulates him to emulate it. Wild nature is not to be regarded merely as a convenient respite from the stresses of civilised living, but as an integral companion to man. Many tired, nerve-shaken, over-civilised people are beginning to find out that going to the mountains is going home, that wildness is a necessity, and that mountain parks and reservations are useful not only as fountains of timber and irrigation rivers, but as fountains of life.

There are a number of political, legal and moral ramifications in the philosophy of bioethics. Morally, it forces man to be more conscious of his rights and responsibilities toward nature. The moral implications of the bioethic principle are beginning to be

recognised in environmental policy making, although the political motivations at the time of its origin were based less on bioethical notions than on commercial considerations of tourism and the promotion of national prestige. But in modern times bioethics is employed to protect wilderness areas, national parks, and wildlife habitats from the pressures of exploitation. Thus it stresses the essential humility of man in the face of natural forces. Nature produces resistance which man ignores at his cost or peril, but which he can accept and understand to his inestimable benefit. Bioethics, therefore, incorporates the notion of limits, or non-negotiable barriers to certain uses of natural areas.

2.10 SELF-RELIANCE THEME

The method of linking self-actualisation to a sense of collective responsibility lay in the establishment of small, self-sustaining communities where nature was still very much in evidence. Many writers were profoundly disturbed by the dehumanising and de-socialising effects of rapid industrialisation and urbanisation, especially the impersonal and alienating atmosphere of the megalopolis. The result was socially counterproductive, the economies of scale-proximity, variety of jobs, housing and entertainment opportunities, simply do not apply beyond a certain size. Size creates its own disadvantages - low productivity because of job dissatisfaction, delinquency due to dissention and frustration, family disruption caused by boredom and lack of communication. The problem is to devise a measurement that compares economic effects with social consequences. Until this is done modern society will continue to drift in the direction of bigness in many areas, including trade and military blocs, regionalisation of local services and governments, and the expansion and concentration of corporate influence. The

answer to this has been suggested by the notion of the economics of permanence; small scale organisation economy of energy use, intermediate technology and creative and small industrial enterprises, where the inhabitants enjoy a breath of education and mix of occupations that combine manual labour with creative intellectual activity.

The essence of civilisation is not, hence, in the manipulation of wants, but in the purification of the human character. Character is formed primarily by a man's work. And work must be properly conducted in conditions of human dignity and freedom. Given these circumstances the worker regards his labour as a matter of pride and utility, not as occupational time that must be suffered in order to have the necessary income to buy happiness elsewhere.

To the ecocentric mind this kind of morality can never be found in the large city, the result, according to Roszak, of a "freakish historical departure" which has produced "a passion for megatechnics and artificiality" (Roszak 1973). Salvation can only lie in the re-emergence of the tribe and personalised collectivity: damnation is the way of the city, the bureaucracy, and the multinational corporation. With the transformation of scale comes the transformation of ethos, and the transmutation of the technocentric to the ecocentric.

In summary, with a self-reliant community, ecocentrism influences in many ways. First, it provides a natural morality - a set of rules for man's behaviour based upon the limits and obligations imposed by natural ecosystems. This natural morality displaces the humanistic morality that is intrinsically derived through man's cultural institutions. Second, it talks of limits of energy flows or productive capacity. These limits impose restrictions upon man's activities and hence influence the compass and direction of progress.

Third, it talks in ecosystem metaphors of permanence and stability, diversity, creativity, homeostasis, and the protection of options. These have important policy ramifications for the preservation of unique ecological and cultural habitats and lifestyle. And finally, ecocentrism preaches the virtues of self-reliance and self-sufficiency.

2.11 POLITICAL FRAMEWORK

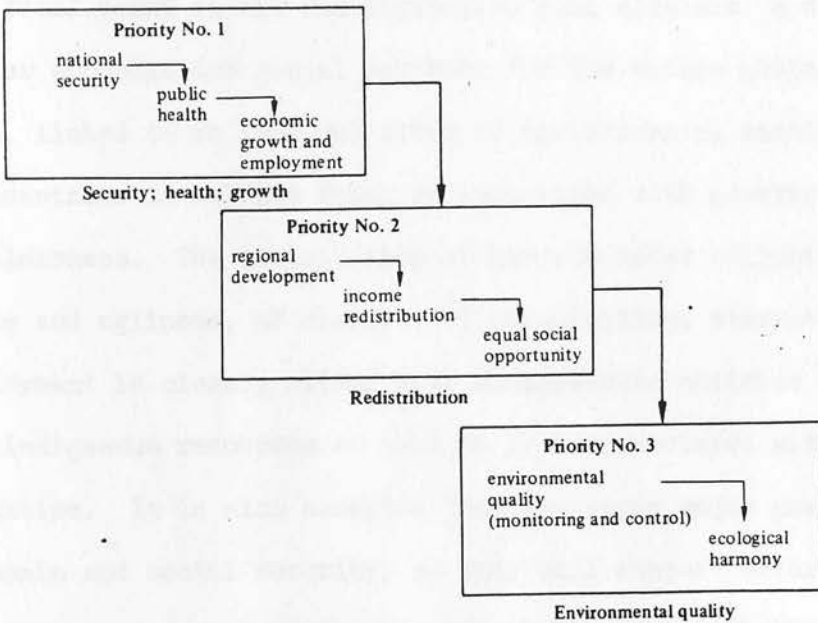
This framework has been largely developed by the new environmentalist movements during the last three decades. Its architectural applications will be implicitly given during the presentation of the rest of the study.

As nations mature, they modulate their political priorities towards improving the general social welfare and increasing the equality of social opportunity. This evolution demonstrates that the first priority of all nations, determined by those who influence the allocation of power, is a goal cluster that embraces national security, public health, and economic growth and employment (T.O. Riordan 1976). A nation that is militarily vulnerable cannot afford the luxury of investing extensively in egalitarian social reform, for in the present time political diplomacy, trading agreements, resource prices and availability are influenced by military status. The considerable investment by all nations is in munitions spending, arms trading, and national defence. Data published by the U.N., in T. O. Riordan's book 'Environmentalism', showed that most nations spend one third to two thirds of the entire national budget on military and defence expenditures and the rest on education and health care.

The scale of military expenditures is emphasised here not simply because it is the target of all peace-loving peoples, but

because it exemplifies the willingness to waste valuable resources and to destroy large areas of ecological value in the interest of security.

The provision of health facilities to achieve adequate levels of public health is second in importance. But generally, economic growth is the driving force of the whole mechanism of national priorities, for growth generates the wealth for investment, employment research and development of organisations that produce economic health. Increases in the collective wealth are generally regarded as vital for improved personal and social well-being, to provide a range of employment possibilities, and to enable research and development to flourish so that growth can be more efficient and equitable. The following FIGURE is based on the U.N. Yearbook of National Accounts' statistics (T.O. Riordan 1976).



The hierarchy of national goals. Broadly speaking, the higher to the left in both the overall diagram and in each box, the more important the goal/objective.

In view of the general characteristics of the kind of environment my study seeks to depict, it would appear quite important to reorder the present hierarchical arrangement of national priorities drawn in the previous Figure. The feeling is that these 'goal clusters' should not be regarded as irreconcilable and only to be accommodated by sacrificing objectives of a lower order for those of a higher order, but that each objective is equally legitimate and essential for attaining a better society on a more habitable planet. The search for ecological harmony, therefore, must take into account considerations such as the proper composition and rate of economic activity, reform in the functioning of social and political activities, and the application of technology that guarantees the stability and permanence of natural processes so our concern with land reform in Africa will be as important as that of protecting wildlife. Such a philosophy is very broad in scope. Its focal point is the redistributive goal clusters, a demand for better economic and social security for the entire global population, linked to an improved level of environmental amenity. Unpleasantness in all its forms is associated with poverty and hopelessness. The distribution of air and water pollution, of noise and ugliness, of disease, of malnutrition, starvation and unemployment is closely allied with unharmonious policies on nature and indigenous resources as much as it is associated with social injustice. It is also accepted that as people enjoy greater economic and social security, so they will support efforts to improve amenities and seek an existence more harmonious with biological imperatives.

Throughout the rest of this study, the implication of such ecological thoughts for economy, population, technology, architectural and planning activities, social and cultural status and so on

will be outlined and discussed either implicitly or directly in the context of each particular issue. I will return in the concluding part of the study to draw my own hierarchical order of priorities in the light of my findings. It was thought that to introduce such order of priorities before fulfilling the whole research and before reaching any conclusion might look preorganised or preconceived and hence false.



FIGURE 5 One of the traditional houses in Baghdad which arouses a genuine and comfortable sensation due to its high representation of a 'sense of place'.

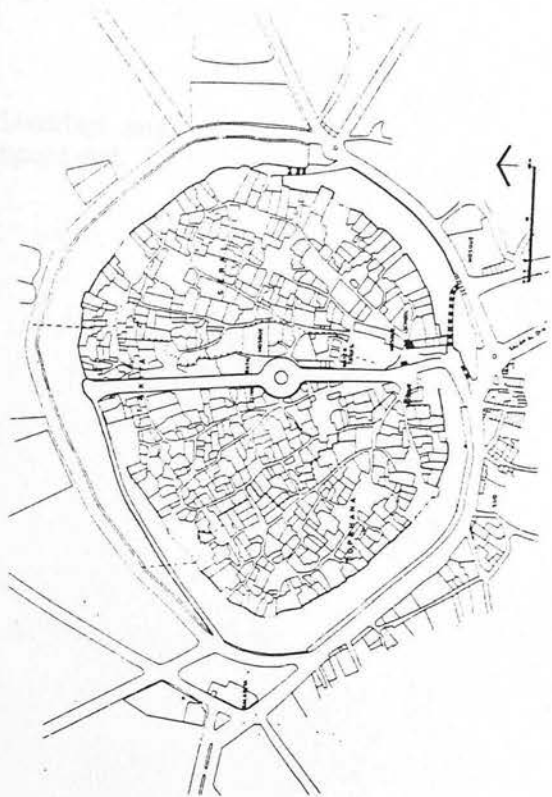
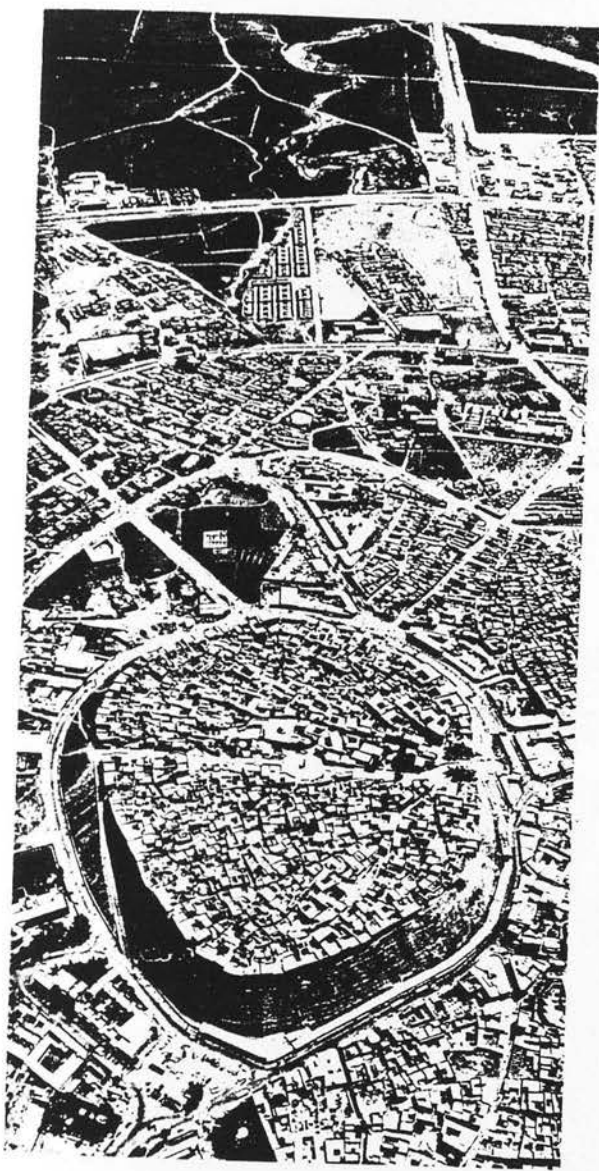


FIGURE 6 The old town of Erbil in Iraq; its spatial and movement patterns are entirely determined according to geographical considerations.

Chapter Three

ECOLOGY

The Laws of Distribution and Abundance of Organisms

Chapter Three

ECOLOGY

We have been introduced to ecology several times so far. Like any expression in science, the word implies very many different meanings. Before we are introduced to the meaning this study holds, I would like to preview in brief the history and development of this field.

3.1 WHAT IS ECOLOGY

An old definition of ecology has been the total relation of the animal to both its organic and its inorganic environment. Obviously this very broad definition has provoked some to point out that, if this is ecology, there is very little that is not ecology! Four biological disciplines are closely related to ecology - genetics, evolution, physiology, and behaviour. Broadly interpreted, ecology overlaps each of these subjects and makes it necessary to look for a more precise definition. Among the various definitions of ecology are those which describe it as scientific natural history (C. Elton 1927) or "the study of the structure and function of nature". A clear definition of this term is this: "Ecology is the scientific study of the distribution and abundance of organism" (H.G. Andrewartha 1961). But it ignores the essential idea of relationship, so a modified definition was suggested by Charles Krebs: "Ecology is the scientific study of the interactions that determine the distribution and abundance of organisms".

3.2 HISTORY OF ECOLOGY

The history of ecology lies in natural history, which is as old as man himself. Primitive groups, which depended on hunting, fishing

and food gathering, needed detailed knowledge of where and when their quarry might be found. Agriculture increased the need to learn about the practical ecology of plants and domestic animals. Spectacular plagues of animals attracted the Egyptians and Babylonians, who feared them as an act of supernatural powers. However, ecological harmony was a guiding principle basic to the Greek understanding of nature. The concept of 'providential ecology', in which nature is designed to benefit and preserve each species, was implicit in writings of Herodotus and Plato. Each species had a special place in nature, and extinction did not occur because it would disrupt this balance and harmony in nature.

Buffon, in his *Natural History*, touched on many of the modern ecological problems and recognised that the population of man, other animals, and plants are subjected to the same processes (Buffon, G.L.L. *Compte De* 1956). In 1798, Malthus published one of the earliest controversial books on demography. In his essay on population, he calculated that although the number of organisms can increase geometrically (1,2,4,8,16 . . .), their food supply may never increase faster than arithmetically (1,2,3,4,5, . . .). Other workers questioned the ideas of Malthus. In 1841, for example, Doubleday brought out his law of population in which he outlined his belief that whenever a species was threatened, nature made a corresponding effort to preserve it by increasing the fertility of its members. Human populations that were undernourished had the highest fertility: those that were well fed had the lowest fertility.

During most of this time the philosophical background had not changed from the idea of the harmony of nature of Plato's day. Providential design was still the guiding light. In the late eighteenth and early nineteenth centuries two ideas that undermined the balance of nature gradually gained support: 1) that many species had become

extinct; 2) that competition caused by population pressure is important in nature. Providential ecology and the balance of nature were replaced by natural selection and the struggle for existence. Many of the early developments in ecology came from the applied fields of agriculture, fisheries, and medicine. Work on the insect pests of crops has been one important source of ideas.

Recognition of communities of living organisms in nature is very old, but specific recognition of the interrelations of the organisms in a community is relatively recent. Some species are, it has been discovered, found only in one zone and other species have a maximum of development in one zone but occur sparsely in other adjacent zones. There has been a recognition of the dynamic aspect of the interrelations between these organisms and their environments. As the environment changed, one species might die out, and another might increase in abundance.

S.A. Forbes (1887), in a classical paper on 'The Lake as a Microcosm', suggested that the species assemblage in a lake was an organic complex, and that by affecting one species we exerted some influence on the whole assemblage. Thus each species maintains a "community of interest" with the other species, and we cannot limit our studies to a single species. Forbes believed that there was a steady balance of nature, which held each species within limits year after year, even though each species was always trying to increase its numbers.

By about 1900, ecology was started on the road to becoming a science with the recognition of the broad problems of populations and communities. The roots of ecology lie in natural history, human demography, biometry and applied problems of agriculture and medicine. One basic problem of ecology is to determine the causes of the distribution and abundance of organism. Every organism lives

in a matrix of space and time that can be considered as a unit. Consequently, these two ideas of distribution and abundance are closely related, although at first glance they may seem quite distinct. The factors that affect the distribution of a species may also affect its abundance. There is considerable overlap between ecology and its related disciplines. Environmental physiology has developed with a wealth of information that impinges on problems of distribution and abundance. Population genetics and ecological genetics are two additional foci of interest. Evolutionary ecology is another interdisciplinary area that has had great implications for the study of distribution and abundance. On one side ecology overlaps with environmental physiology and behaviour in studies of individual organisms, but on the other hand, ecology fades into meteorology, geology, and geochemistry when considering biosphere, the whole-earth ecosystem. In ecology we deal with three levels of integration: Ecosystem, Community, and Population, and each level involves separate attributes and problems. For example, a population has a density, a property that cannot be attributed to an individual organism. A community has a species diversity which is without meaning at the population level. In general, dealing with a particular level seeks explanatory mechanisms from lower levels of integration and biological significance from higher levels.

Some ecologists have suggested that the ecosystem, the biotic community and its abiotic environment, is the basic unit of ecology. Ecosystems may be particularly significant, but it is only of the levels or organisation at which ecologists operate.

The extent of scientific understanding varies with the level of integration. We know a good deal about the molecular and cellular levels of organisms, but we know less about population and even less

about communities. Whatever the reason for that, it has serious implications for the study of ecology.

The theoretical framework of ecology may be weak at the present time, but this must not be interpreted as a terminal condition. Sciences are not static and ecology is in a strong growth phase.

3.3 HUMAN ECOLOGY

The term "human ecology" was introduced during the twenties and represented an attempt to systematically apply the basic theoretical scheme of plant and animal ecology to the study of human communities. A body of ecological theory was developed in the twenties and thirties whose derivation from biology had a strong influence on classical human ecology. According to this body of theory, the basic process in human relationships is competition, largely involving a struggle for space. Because of the high degree of interdependence and division of labour among humans, competition must always involve an unplanned degree of co-operation, forming what is called competitive co-operation. As a result, men form relationships of unplanned interdependence called symbiotic relationships. Human society is seen as organised on two levels: the biotic and cultural. The biotic level involves basic, subconscious adjustments made in the struggle for existence. This level is regarded as subsocial and is based on the organisation of symbiotic relationships. The struggle for existence, based on competitive co-operation, and resulting in the organisation of the biotic level of society, also determines the spatial distribution of persons. The spatial distribution is therefore seen as reflecting the organisation of the biotic level of society. The cultural level of society, based on communication and consensus, is seen as a superstructure resting upon the biotic level. The biotic level is referred to as community, and the cultural level

as society. The biotic level of human organisation is regarded as the proper field of investigation for human ecology, and therefore cultural factors are excluded from ecological investigations (G.A. Theodorson 1961). However, human ecology was a body of knowledge essential for the study of social life. Its kinship to, and derivation from, geography and biology was recognisable. The emphasis was that human ecology, unlike cultural ecology, was less concerned with the relationship between man and his habitat than with the relationship between man and man as affected, among other factors, by his habitat (L. Wirch 1945). It should be noted also, that although most studies of human ecology have been concerned with urban and rural communities, it has also been applied to many regions of the world. Thus the patterns of urbanisation, the trends of migration, the inter-relations between regions, the functions of boundaries and other aspects, have been widely studied. There is, however, every reason to believe that in the future the knowledge gained from local and small-scale research of human ecology will be applied to a larger-scale field of human aspects.

In the following years the classical distinction between biotic and cultural levels has been particularly criticised by many ecologists. They accused the classical ecologists of a kind of biological determinism and were also critical of their use of the dichotomy of biotic versus cultural levels. From such intellectual atmosphere the cultural ecology has emerged to stress the ubiquitous presence of culture in all human relationships (we will be introduced to the cultural ecology in the following chapter when we study the concept of culture). Human ecology survived the criticisms which undermined the classical theory. The theoretical assumptions of human ecologists have changed from those held by the pioneer ecologists. A distinction between the biotic and cultural levels of human organisation is no longer

made. THE IMPOSSIBILITY OF EXCLUDING CULTURAL FACTORS FROM ECOLOGICAL INVESTIGATIONS IS WELL RECOGNISED TODAY. Ecologists, however, are not agreed as to the extent to which culture should be the primary explanatory concept in ecological theory. Those who place primary emphasis on culture have been referred to as 'sociocultural' ecologists. Another current ecological approach may be referred to as 'neo-orthodox'. Closer to traditional ecology, it rejects culture or values as a primary explanatory concept in ecological theory, but, on the other hand, it does not accept many of the assumptions of classical ecology.

3.4 HUMAN GEOGRAPHY

Human geography developed in the late nineteenth and early twentieth century out of the study of general geography and the work of some writers. These writers emphasized the influence of the physical environment on human culture, and in the early years of its development human geography was associated with geographical determinism. After the decline of geographical determinism, human geography came to emphasize the reciprocal relationships between culture and physical environment without any assumption of a simple one-way determination of culture, by physical environment. The term 'human geography' has declined in general usage, many writers preferring to refer to their studies as human ecology and, more recently, cultural ecology. We might be introduced to another term, the 'natural ecology', which means, as it may clearly seem, nature and the natural elements as distinguished from cultural or human ecologies.

3.5 BROADENING PERSPECTIVE

We have traced the meaning and development of the various concepts of ecology. It is apparent that the followers of each

concept tended to limit the meaning and use of ecology within their theoretical framework. Whether in human ecology, sociocultural or cultural ecology, elements of the research were obviously separable and unrelatedly attended. That is, it is quite apparent that we must include, and distinguish between, both natural (which includes biotic) and cultural elements in the set of external antecedents to human behaviour. As J.W. Berry stated, we are immediately faced with the problem that when we sample behavioural variation cross-culturally, we must inevitably also sample it across natural habitats.

Berry suggested that research which has been limited to cultural relations is necessarily incomplete. Alternatively, research which has attended only to ecological variation is also incomplete. Cultural and ecological factors, he stated, covary. In practice, though cultural adaptation is not entirely determined, it is probabilistically related to ecological setting. ECOLOGY ACCORDING TO OUR VIEW, THEREFORE, WILL INCLUDE AN INTERDEPENDANT RELATIONSHIP BETWEEN NATURAL AND CULTURAL FACTORS IN WHICH CULTURAL FEATURES ARE ADAPTED TO THEIR NATURAL SETTING. IN THIS STUDY THE AIM HAS NOT BEEN TO DEVELOP A THEORY OF ECOLOGY AS AN END IN ITSELF. RATHER, TO CONSIDER IN ECOLOGY THE EMPIRICAL INVESTIGATION INTO THE VARIOUS BIOTIC, PHYSICAL ENVIRONMENTAL AND CULTURAL FACTORS THAT IMPINGE ON HUMANS, HENCE AFFECTING THEIR BEHAVIOUR, AND CHARACTERISING THEIR ARTIFACTS. THESE ANTICEDENTS TO BEHAVIOUR INCLUDE VARIOUS FACTORS CITED IN CHAPTERS SIX AND SEVEN. THE STUDY AIMS AT THE DEMONSTRATION OF HOW THESE INTERDEPENDENT ECO/CULTURAL FACTORS SHAPE PEOPLE'S LIFE-STYLE AND OPEN UP CHOICES OF BUILDING FORMS, HENCE ESTABLISHING ARCHITECTURAL CHARACTER SPECIFIC TO ITS SETTING. AN ESSENTIAL STEP WILL BE TOWARDS RELATING THE PHYSICAL STRUCTURE OF THE TOWNS WHICH INCLUDE, BESIDES BUILDING FORMS, THE SPATIAL ORGANISATION, CITY MORPHOLOGY AND GROWTH, TO THE LOCAL ECOLOGICAL CONDITIONS. ALSO

IMPORTANT IS THE WAY THESE CONDITIONS WORK TO AFFECT THE SOCIAL BEHAVIOUR AND SOCIAL STRUCTURE DRAWING IN AT THE SAME TIME THE SOCIAL IMPLICATIONS OF BUILT FORM. THE STUDY HOPES ALSO TO EXPLAIN SOME CRUCIAL ISSUES CONCERNING PATTERNS OF CHANGE AND EVOLUTIONAL PROCESSES OF PEOPLE'S CULTURE SO THAT A GENERAL FRAMEWORK WOULD BE UNIVERSALLY APPLICABLE.

3.6 THE DIFFERENTIATIONAL ROLE OF ECOLOGY

The major theoretical and empirical contributions of the notion of ecological differentiation are in the role ecology holds in producing different cultures. In other words, sometimes it is possible to draw a sharp boundary line between one culture and another, when there is a sharp change in the soil, topography or climate. At other times, there may be broad zones of transition where type grades into the other. Just as the distribution of plants is influenced by conditions of soil and climate, so culture is conditioned by its geographical settings. It happens sometimes that two cultures or more resemble each other in their general appearance and habit, but differ radically in their internal structures. It is only by tracing the history of the parts that we can fully understand the whole. It often happens that we mix up the physical environment, which is normally associated with climate, topography, vegetation and the like, with ecology, which is more than that. It is often almost impossible for any two geographical areas to possess the same ecological attributes. It follows that any change in one or more ecological factors will lead to essential change in the cultural structure that ought to be traced, and hence considered in design. The object of these words is to suggest that theorists should give more attention to the ecological aspects of culture than they have done. It is important that we should consider ecological differences

among whole regions, leaving not the least inhabited area unstudied. The smallest and most remote social group has to solve its own problems of self-preservation, to establish and sustain its own building experience, and to adapt itself to, and exploit its ecology which is hardly ever exactly the same in any two regions. Differences of altitude, slope, soil, small variations, in climate, differences of vegetation, etc., all affect the way in which men lead their lives. That is, without the natural background of human activity, man himself is a mere abstraction, and the study of his culture is apt to lose reality. Some have argued that within the same geographical area there might exist more than one culture such as the case with the Eskimo, for example. It is this very example which demonstrates perfectly the meaning of ecology and distinguishes it from mere physical conditions. That is, the Arctic areas are apparently similar but they differ in the way they provide resources to their inhabitants such as food resources. As a result, food preparation, food gathering techniques, social and individual behaviours and rituals related to hunting are entirely different. It follows that many groups have established their own way of life due to this very reason. IN BROADEST TERMS, ECOLOGY REFERS TO THE WHOLE COMPLEXITY OF FACTORS AND CONDITIONS WHICH FIRST, SHAPES PEOPLE'S LIFESTYLE, NORMS, BEHAVIOURAL PATTERNS AND BELIEFS, IN SHORT, CULTURE: AND, SECOND, AND MOST IMPORTANT, DIFFERENTIATES ANY SOCIAL GROUP FROM ANOTHER.

Although the concept of ecological differentiation has not been universally appreciated yet, its most frequent employment has been some individual works of a very small scale not exceeding single houses or small cultural buildings (e.g. Bawa; Hasan Fathy). On the other hand, due to both imported and diffused techniques, it is becoming more difficult to differentiate among many apparently similar areas. A high level of differentiation implies clear

separation of what is identified as belonging to certain ecological areas and what is identified as external to it. Any ecological area is experienced as having definite limits or boundaries. Segregation of ecological areas helps make possible greater determination of functioning from within, as opposed to a more or less enforced reliance on external support for maintenance.

3.7 NATURE OF THE ECOLOGICAL ENVIRONMENT

Egon Brunswick stated that "both organism and environment will have to be seen as a system, each with properties of its own, yet both hewn from basically the same block . . . the two systems have the essential characteristic of a coming-to-terms". Furthermore, not only organism and environment were described as being characterised with such a close bond, but N. Teymur suggested that both classifications are one in reality (N. Teymur 1982). He added that the conceptual structure of the environmental discourse consists basically of coupled terms; 'Man' and 'Environment' (and their variants, such as organism, milieu, society, space, etc.). Yet they are distinguished by particular rules which make them possible. He gives further examples of these conceptual couples such as good-bad, right-wrong, form-function, public-private, being-knowledge, sacred-profane, etc. Most of these couples constitute some more or less closed and self justifying wholes which imply 'original' unities that are split and divided into oppositions, dichotomies, etc. These oppositions produce situations that lead to some mistakes which are only too apparent in Man-Environment discourse. For example, the boundary between Man and Environment, even assuming for a moment that there are two such elements, is an imaginary boundary and not a real one. Teymur immediately criticised these binary distinctions or discriminations on the basis of the divisions. There would be no

such separation in reality. Similarly, it is suggested, often profoundly, that there exists no classification and no boundary in nature. It is 'we' the human mind, which imposes upon the world a system of classification which, in return, makes the world appear to us as separate, binary, and classified. It has been stated somewhere that "classification is a human invention and the world is not given to us in a classified form".

The obvious difficulty of such a situation stems from the fact that even when both man and environment are considered one reality, it appears that we are systematically used to conceiving them as two elements. Certainly the environment which man is creating for himself now is more threatening and also more promising than it was several decades ago, which in turn emphasizes the distance between man and environment as two opposing elements. Changes in our ecology ranging from new levels of radiation and pollution, to increased numbers of people, new kinds of machines, enormous social organisation, etc. are all altering our ecology. With such complexity of change how is it possible to maintain an authentic relation between architecture and its ecological environmental setting? It is only when considering man as an essential part of environment, and his over-all behaviour corresponds in general to the attributes of environment, which Roger Barker introduces next, that an answer to this question becomes possible.

Roger Barker suggests that the physical and biological sciences have gathered almost limitless information about the environment and that some of it bears directly upon the previous issues. The three attributes he maintained have been independently affirmed and reaffirmed by many observing techniques and instruments. They are, he states, elementary facts which are far removed from the simple human observation (R. Barker 1963).

1) ORDER in the perceptual environment. Chemists, physicists, botanists and astronomers affirmed that environment is not a 'chaotic' jumble of independent odds and ends. It consists of bounded and internally patterned units that are frequently arranged in precisely ordered arrays and sequences. Barker maintains that although the problem of identifying the environmental parts is great, it is not, primarily, to bring order out of disorder. On the contrary, its first task is to describe and explain the surprising structures and orders that appear in nature, and also to account for the occasional absence of order and organisation in atomic explosions, in cancerous growths, and in social disorder.

On the other hand, order and lawfulness are by no means spread uniformly across the physical world; the preperceptual world is not one system but many, and their boundaries and interconnections have to be discovered.

2) DIRECTION AND PURPOSE in the preperceptual environment. A frequent arrangement of ecological units is in nesting assemblies and these are not directionless in relation to their parts. They are self-regulated entities with control circuits that guide their components to characteristic states and that maintain these states within limited ranges of values in the face of disturbances. Barker adds that there are mutual causal relations up and down and the environment is made up of systems within systems. An entity, hence, constrains and is constrained by the outside unit that surrounds it and by the inside units it surrounds. The units influence themselves through each other. He gives an example: a beam determines its own strength by its contribution to the structure into which it is built; a word defines itself by its contribution to the meaning of the sentence of which it is a part.

3) INCOMMENSURABILITY in the preperceptual environment. The

conceptual incommensurability does not appear to trouble nature's units although it is such an obstacle to the unification of sciences, Barker stated. The topologically larger units of nesting structures have greater variety among their parts than smaller units: a river is internally more varied than a brook; an organism encompasses a greater variety of structures and processes than a cell. He gives another example aiming at simpler understanding of this notion by suggesting that in an established pond, a great variety of physical and biological entities and processes are integrated into a stable, self-regulated unit; the component, interrelated entities range from oxygen molecules to diving beetles. This suggests that within certain levels of nesting structures conceptual incommensurability of phenomena does not prevent integration and regulation. As W.E. Ashby stated, self-regulated units with widely varied component entities are, in general, more stable than units with lesser variety.

In summary, Barker concludes that the sciences which deal with the entities and events of the environment directly do not find them to be chaotic or only probabilistic in their occurrence. These sciences, in particular biological and physical sciences, do not find the environmental entities to be without direction with respect to their component parts, and conceptual incommensurability does not prevent the integration and lawful regulation of ecological entities.

MAN, AS AN ENTITY, IS BOUND WITH ORDER AND LAWFUL INTEGRATION TO THE OTHER ENTITIES, INCLUDING BOTH BIOLOGICAL AND PHYSICAL UNITS OF HIS ENVIRONMENT. HE BUILDS AND CONTINUOUSLY CHANGES AND MODIFYS HIS HABITAT AS SELF-REGULATING PROCESS REQUIRED TO MAINTAIN GREATER VARIETY IN INCOMMENSURABLE ECOLOGICAL STRUCTURE. THIS, NO DOUBT, JUSTIFIES THE VARIETY OF HIS STYLES AND DESIGN NOTIONS BUT DOES NOT EXPLAIN IT.

3.8 IMPLICATION

Buildings of the present time are mostly monotonous, meaningless, and quite alike because they embody merely universal economical/technical values in abstract ideas of their own designers. They have been increasingly ignoring man in the first place by ignoring his nature, biology and most importantly his relationships to the specific settings of his ecological environment. THE TWO CENTRAL THEMES OF ECOLOGY ARE: FIRST, ECOLOGY INFLUENCES MAN'S CULTURE, AND CHOICES OF ARCHITECTURAL FORMS ARE AN OUTCOME OF ADAPTIVE PROCESSES; AND SECOND, THE VARIOUS AND DIFFERENT AESTHETICAL AND SOCIAL ASPECTS OF ARCHITECTURAL FORM ARE A MANIFESTATION OF THE DIFFERENTIATIONAL ROLE OF ECOLOGY; IT PRODUCES DIFFERENT BUILDINGS, BEAUTIFUL, MEANINGFUL AND MORE FITTING TO THEIR CONTEXTS.

In a later chapter we will be introduced to the study of the various ecological factors and their implication in a detailed way in order to demonstrate their implication in building forms in particular and in establishing the character of the total built environment in general.

Chapter Four

CULTURE

An Outcome Values of Man's Adaptation to His Ecological Settings

Chapter Four

C U L T U R E

4.1 INTRODUCTION

In Chapter Two we came across a major notion which stated that beyond the physical factors lies a highly important and more abstract environmental component of culture (Article 2-6). Without the cultural context there would be no functions for the designed object in the first place. Here I will introduce the study of culture; the history and development of its various meanings and its relation to ecology. The study emphasises that what underlies the adaptive process of design activities is a set of holistic principles acting within an interplay of three elements: ecology, culture and cognition. Hence further attempts will be made to link the concept of culture to the cognitive structure, so as to examine their role in architecture.

4.2 DEFINITIONS

The term culture has been applied to many different sized units of society. Thus there are many levels of culture, from broad aspects of society to very small social units. One simple and broad definition of culture states that culture is the man-made part of the human environment. It has several key components. Firstly, it refers to beliefs and perceptions, values and norms, customs and behaviours of a group or society. Culture includes what people believe to be true of the world, their lives, and the environment. It also includes their values, or what they hold to be good and bad, acceptable and unacceptable. Another part of it is a set of rules and beliefs about how to behave or do things

(I. Altman & M. Chemers 1980). Thus, cognitions, perceptions, values and modes of appropriate behaviour constitute a cluster of characteristics implied in the concept of culture. Second, the term culture is used to indicate that cognition, feelings, and behaviour are shared among a group of people in a consensual way. It implies that there are common ways to view the world and to behave and that consensus is a central feature of the concept of culture. Third, the term culture implies that these shared beliefs, values and styles of behaviour are passed on to others, especially children, and that the socialisation and education of new members of the culture help preserve consensus from one generation to the next. Except for dramatic events, cultural changes are slow and evolutionary, partly because so much of a culture is implicit, taken for granted, and difficult to label. Fourth, a society's values, beliefs, and practices involve more than mental and behavioural processes - culture appears in objects and in the physical environment. Home designs, community layouts, and public buildings, often explicitly reflect the values and beliefs of a culture. The concept of culture reflects a multi-faced set of things, from abstract principles about how to view the world, to more concrete actions, such as ways of behaving and relating to the environment and ways of raising children.

In general there is no shortage of definitions for the concept of "culture" in the various disciplines. Kroeber and Kluckhohn (1952) emphasise a number of characteristics of the concept as it is currently used:

"A set of attributes and products of human societies, and therewith of mankind, which are extra-sematic and transmissible by mechanisms other than biological heredity, and are as essentially lacking in sub-human species as they are characteristic of the human species as it is aggregated in its societies."

In substance, we may define culture simply as "the way of life of a group of people". This is consistent with its definition as a learned and shared pattern of behaviour which is characteristic of a group living within fairly defined boundaries and which is interacting socially among themselves. Two levels of culture are usually discerned (Krech, Crutchfield & Ballachey 1963). One is an overt form, often called explicit culture, which is the readily observable regularity in the behaviour of the group; the other is a covert form, often called implicit culture, which is the set of patterns, rules, or the structure inferred to account for this observed regularity (J. Berry 1976). Many anthropologists prefer to limit the concept to the implicit level, and to leave the directly observable behaviour to other disciplines (e.g. psychology). Whether behaviour is to be included in culture remains a matter of dispute. The behaviour as used here is the concrete behaviour of the individual, rather than any collective abstraction. The inclination to exclude behaviour as such is on two grounds. First, there is also human behaviour not determined by culture, so that behaviour as such cannot be used as a differentiating criterion of culture. Second, culture, being basically a form, pattern, design or way, is an abstraction from concrete human behaviour, but is not itself behaviour. Behaviour is a pre-condition of culture; just as the locus or residence of culture can only be in the human individuals from whose behaviour it is inferred or formulated. It seems that the inclusion of behaviour in culture is due to confusion between what is a pre-condition of culture and what constitutes culture.

This conceptual distinction between culture and behaviour is important to maintaining conceptual distance between "culture" and

"behaviour", thus permitting the development of an interdisciplinary study of their relationships (J. Berry 1976).

4.3 MAN, ENVIRONMENT, CULTURE

The problem has been about the nature of the relationship between man and his ecological environment. The old answer was that the physical environment makes man do what he does or influences him in what he does. This, what has been called the physical determinism, considers physical environment to be of primary importance. The other extreme answer for this problem has been that man's culture is the primary determining factor. The environment, according to this view, is secondary in its role in almost all cases and that same physical environment plays an entirely different role for the farmer, manufacturer, the hunter and pastoralist etc. It is an inevitable conclusion then that the environment cannot be the determining factor. As we still ask just why and in what way man alters his environment, the answer has been varied from place to place, and from group to group (G. Carter 1978).

A second approach states that, except in very rare cases, man has choices open to him, and out of the many possibilities he chooses one or another. This is the position held by the possibilist school of thought opposed to both environmental and cultural determinism. Another thought claims that man's perception of his environment is the principal determinant in how he lives in any particular time and place. Here, again, one must ask where do men get their perception? In all these three approaches, those who advocate them still have to pursue the 'why' of differing impacts of man on land choices, and perceptions which lead to the differentiated built forms.

4.4 THE SCHOOL OF CULTURAL ECOLOGY

The relation between people, culture and environment forms the backbone of several disciplines in the social and behavioural sciences. Human ecologists focus on culture and environment, while anthropologists are quite interested in how people in different cultures and at different periods in history have shaped their homes, communities and cities in relation to cultural and environmental variables. There have been several analyses that bear on relations between culture and environment (I. Altman 1980). These fall under the label of studies of cultural ecology. In general the cultural ecology viewpoint emphasises the role of the physical environment as one powerful determinant of customs, lifestyle, and behaviours in different cultures. Some adapt a strong version of the culture-environment relationship in which the environmental phenomena are considered to be responsible for the origin or development of the cultural behaviour. The environment, in this approach, is seen as strongly determining, limiting and affecting behaviour and cultural process. Another approach, "a weak" or orientation to culture and environment, is less firm in its view about how the environment affects social systems. It focuses on the interrelations of cultural and environmental variables in networks and patterns of dependencies and is less concerned with establishing hard and fast causal relations (I. Altman 1980).

John W. Berry, a pioneer in cultural ecology, suggested that many anthropologists do not admit any role for ecological factors, while those who do claim a number of differing points of interaction and influence. Essentially, there are two extremes between which cultural ecologists vary. Berry abstracts Vayda's assertion that "The main ways of relating cultural behaviour to environmental

phenomena may be distinguished: either showing that items of cultural behaviour function as part of systems that also include environmental phenomena, or else showing that the environmental phenomena are responsible in some manner for the origin or development of the cultural behaviour" (Vayda 1969). The former, the weak version, as Berry calls it, is a correlative approach which emphasises the functional interdependencies between physical-environmental and cultural variables while the latter (the strong version) is a causal approach which attempts to account for cultural origins.

Within the weak version opinions range, but it might be interesting to present the opinion which considers culture as man's most important instrument of adaptation. A culture is made up of the energy systems, the objective and specific artifacts, the organisation of social relations, the modes of thought, the ideologies and the total range of customary behaviour that are transmitted from one generation to another by a social group and that enable it to maintain life in a particular habitat (Cohen 1968).

Spokesmen for the deterministic or 'strong' version have also ranged over a similar dimension. An example is the following assertion of Boas (Boas 1911):

"It is not difficult to illustrate the important influence of geographical environment upon forms of inventions. The variety of habitations used by tribes of different areas offer an example of its influence . . . environmental influences appear in the territorial limits of certain tribes or peoples, as well as in the distribution and density of population. Even in the more complex forms of the mental life, the influence of environment may be found; as in nature myths explaining the activity of volcanoes or the presence of curious land-forms, or in beliefs and customs relating to the local characterisation of the seasons".

4.5 THE CONCEPT AND PHILOSOPHY OF CULTURAL ECOLOGY

The principal meaning of ecology, according to this school, is ADAPTATION to environment. Since the time of Darwin, environment has been conceived as the total web of life wherein all plant and animal species interact with one another and with physical features in a particular unit of territory. The biological meaning of ecology is the natural relations between organisms and their environment. The concept of adaptive interaction is used to explain the origin of new genotypes in evolution; to explain phenotypical variations; and to describe the web of life itself in terms of competition, succession, climax, gradients and other auxiliary concepts (J. Steward 1955). Steward stated that, although initially employed with reference to biotic assemblages, the concept of ecology has naturally been extended to include human beings since they are part of the web of life in most parts of the world. Man introduces the super-organic factor of culture, which also affects and is also affected by the total web of life (J.W. Berry 1976; J. Steward 1955).

THE INTERACTION OF PHYSICAL, BIOLOGICAL AND CULTURAL FEATURES WITHIN A LOCAL OR UNIT OF TERRITORY IS USUALLY THE ULTIMATE OBJECTIVE OF THIS THESIS. Human ecology is regarded as a sub-discipline and not as means to some further end. (See Article 3-3 and J.H. Steward 1955). Steward suggests that if human ecology is considered an operational tool rather than an end in itself, two different objectives are suggested. First, an understanding of the organic functions and genetic variations of man as a purely biological species, second, a determination of how culture is affected by its adaptation to environment.

The first, or biological, objective involves some different problems, all of which must view man in the web of life. Since he is a domesticated animal, he is affected physically by all his cultural activities. The evolution of the Hominidae is closely related to the emergence of culture, while appearance of *Homo sapiens* is probably more the result of cultural causes than of physical causes. The use of tools, fire, shelter, clothing, new foods, and other material adjuncts of existence were obviously imported in evolution, but social customs should not be overlooked. Social groups, as determined by marriage customs as well as economic activities in particular environments, have undoubtedly been crucial in the differentiations of local populations, and may even have contributed to the emergence of varieties and sub-races of men.

Human beings do not react to the web of life solely through their genetically-derived organic equipment. Culture, rather than genetic potential for adaptation, accommodation, and survival, explains the nature of human societies. Moreover, the web of life of any local human society may extend far beyond the immediate physical environment and biotic assemblage. If therefore, the nature of human communities is the objective of analysis, explanations will be found through use of cultural/historical concepts and methods rather than biological concepts, although historical methods alone are insufficient.

A fundamental scientific problem is involved in these different meanings attached to ecology. Is the objective to find universal laws or processes, or is it to explain special phenomena? In biology, Steward stated, the law of evolution and the auxiliary principles of ecology are applicable to all webs of life regardless of the species and physical environments involved. In social

science studies, there is a similar effort to discover universal processes of cultural change. But such processes cannot be conceptualised in biological terms. Analysing environmental adaptations to show how new cultural patterns arise is a very different matter than seeking universal similarities in such adaptation. Until the processes of cultural ecology are understood in the many particulars exemplified by different cultures in different parts of the world, a formulation of universal processes will be impossible.

Cultural phenomena has been taken into account in Hawley's statement that "man reacts to the web of life as a cultural animal rather than as a biological species". Each acquisition of a new technique, regardless of the source of its origin, alters man's relations with the organisms about him and changes this position in the biotic community. If we had sufficient knowledge of preliterate peoples to enable us to compare the structure of residence group arranged in order of size from smallest to largest, we should undoubtedly observe the same phenomena - each increment in size is accompanied by an advance in the complexity of organisation. But Hawley claims also that each habitat not only permits, but to a certain extent necessitates, a distinctive mode of life (J.H. Steward 1955).

The normative concept, which views culture as a system of mutually reinforcing practices backed by a set of attitudes and values, seems to regard all human behaviour as so completely determined by culture that environmental adaptations have no effect. It considers that the entire pattern of technology, land use, land tenure and social features derive entirely from culture. Cultures do tend to perpetuate themselves and change may be slow, but over the millenia cultures in different environments have changed tremendously, and these changes are basically traceable to new

adaptations required by changing technology and productive arrangements. Whether or not new technologies are valuable is a function of the society's cultural level as well as of environmental potentials.

The concept of cultural ecology is less concerned with the origin and diffusion of technologies than with the fact that they may be used differently and entail different social arrangements in each environment. The environment is not only permissive or prohibitive with respect to these technologies, but special local features may require social adaptations which have far reaching consequences. Thus, societies equipped with similar tools may differ among themselves because of the nature of the terrain and fauna. They may exhibit other social patterns because the environments differ to the extent that the cultural adaptations must be different. The adaptive processes, here, are properly designated ecological. But attention is directed not simply to the human community as part of the total web of life but to such cultural features as are affected by the adaptations. This in turn requires that primary attention be paid only to relevant environmental features rather than to the web of life for its own sake. Only those features to which the local culture ascribes importance need be considered.

Although the concept of environmental adaptation underlies all cultural ecology, the procedures must take into account the complexity and level of the culture. It makes a great deal of difference whether a community consists of hunters and gatherers who subsist independently by their own efforts or whether it is an outpost of a wealthy nation, which exploits local mineral wealth and is sustained by railroads, ships or airplanes. In advanced societies, the nature of the culture core will be determined by a complex technology and

by productive arrangements which themselves have a long cultural history.

Three fundamental procedures of cultural ecology are as follows. First, the interrelationship of exploitative or productive technology and environment must be analysed. This technology includes a considerable part of what is often called "material culture" but all features may not be of equal importance. In primitive societies, subsistence devices are basic: weapons and instruments for hunting and fishing, etc., and, in some environments, means of countering excessive cold or heat. In more developed societies, agriculture and herding techniques and manufacturing of crucial implements must be considered. In an industrial world, capital and credit arrangements, trade systems and the like are crucial.

Relevant environmental features depend upon the culture. The simpler cultures are more directly conditioned by the environment than advanced ones. In general, climate, topography, soils, hydrography, vegetational cover and fauna are crucial, but some features may be more important than others. Second, the behaviour patterns involved in the exploitation of a particular area by means of a particular technology must be analysed. Some subsistence patterns impose very narrow limits on the general mode of life of the people, while others allow considerable latitude. The third procedure is to ascertain the extent to which the behaviour patterns entailed in exploiting the environment affect other aspects of culture. Although technology and environment prescribe that certain things must be done at all, the extent to which these activities are functionally tied to other aspects of culture is a purely empirical problem. In the irrigation areas of early civilisations, the sequence of socio-political forms or cultural cores seems to have been very similar despite variation in many outward details or secondary

features of these cultures. If it can be established that the productive arrangements permit great latitude in the socio-cultural type, then historical influences may explain the particular type found. The problem is the same in considering modern industrial civilisations.

The third procedure requires a genuinely holistic approach, for if such factors as demography, settlement pattern, kinship structure, land tenure, land use, and other key cultural features are considered separately, their interrelationships to one another and to the environment cannot be grasped. Land use by means of a given technology permits a certain population density. The clustering of this population will depend partly upon where resources occur and upon transportational devices. The composition of these clusters will be a function of their size, of the nature of subsistence activities, and of cultural-historical factors.

Cultural ecology has been described as a methodological tool for ascertaining how the adaptation of a culture to its environment may entail certain changes. In a larger sense, the problem is to determine whether similar adjustments occur in similar environments. Since in any given environment, culture may develop through a succession of very unlike periods, it is sometimes pointed out that environment, the constant, obviously has no relationship to cultural type. This difficulty disappears, however, if the level of socio-cultural integration represented by each period is taken into account. Cultural types therefore, must be conceived as constellations of core features which arise out of environmental adaptations and which represent similar levels of integration.

Cultural diffusion always operates, but in view of the seeming importance of ecological adaptations its role in explaining culture has been greatly overestimated. The extent to which the large

variety of world cultures can be systematised in categories of types and explained through cross-cultural regularities of developmental process is purely an empirical matter (J.H. Steward 1955).

4.6 THE CONCEPT OF CULTURAL CORE

One major contribution the school of cultural ecology has produced is the concept of cultural core. J.H. Steward presented the concept as a constellation of features which are most closely related to subsistence activities and economic arrangements. The core includes such social, political and religious patterns as are empirically determined to be closely connected with those arrangements. Other features may have great potential variability because they are less strongly tied to the core. These latter, or secondary, features are determined to a great extent by purely cultural-historical factors - by random innovations or by diffusion, and they give the appearance of outward distinctiveness to cultures with similar cores. Cultural ecology pays primary attention to those features which empirical analysis shows to be most closely involved in the utilisation of environment in culturally prescribed ways.

4.7 CULTURAL EVOLUTION

One potential difficulty is the confusion between the cultural-ecology and the cultural-evolution points of view (Berry 1976). The most detailed treatment of this issue is contained in a set of essays by Sahlins and Service (1960). They started by introducing some definitions of the term evolution. To some anthropologists, they stated, evolution is simply change. To others it is growth or development, which is a special kind of change. Some would outlaw the concept of progress from evolution. Others accept 'advance' but eschew the term 'progress'. Another finds progress

of the very essence. Some stated that evolution in its most significant aspect is 'multilinear' and in its least significant aspect, universal (Steward 1953).

There have been two main views about the nature of evolution. One view says that forms and the succession of forms are the foci of concern. "Evolution is descent with modification, or Evolution is the succession of cultural stages". The second conceives evolution as a grand movement in a certain direction and when changes in form follow that direction they are evolutionary. This perspective embraces the totality of forms, the whole of life or culture. "Evolution is a movement from homogeneity to heterogeneity" is an example of the grand-movement view. Within the second view is Julian Huxley's definition of evolution. He stated that "Evolution may be regarded as the process by which the utilisation of the earth's resources by living matter is rendered progressively more efficient" (Huxley 1943). Here the emphasis is on a total movement in which given life forms are, in a sense, the instrument or even the consequence. Sahlins and Service consider such a view is more fruitful in the sense that it is more helpful in understanding the facts normally considered evolutionary.

Sahlins and Service noticed that in both its biological and cultural spheres, evolution moves simultaneously in two directions. On one side, it creates diversity through adaptive modification: new forms differentiate from old. On the other side, evolution generates progress: higher forms arise from, and surpass, lower forms. The first of these directions is Specific Evolution, and the second General Evolution. But both are aspects of the same total process, which is also to say, two contexts in which we may place the same evolutionary things and events. Any given change in a

form of life or culture can be viewed either in the perspective of adaptation or from the point of view of overall progress (Sahlins and Service 1960).

Culture continues the evolutionary process by new means. Since these cultural means are unique, cultural evolution takes on distinctive characteristics. But still culture diversifies by adaptive specialisation and still it successively produces overall higher forms. Culture, like life, undergoes specific and general evolution. Culture is man's means of adaptation. It provides the technology for appropriating nature's energy and putting it to service, as well as the social and ideological means of implementing the process. In this, adaptive process elements within a culture are synthesised to form new traits, an event we call 'invention', and items made available from the outside are incorporated, a process we call 'diffusion' or sometimes 'acculturation'.

Sahlins and Service stated that, viewed specifically, the adaptive modifications occurring in different historical circumstances are incomparable; each is adequate in its own way, given the adaptive problems confronted and the available means of meeting them. No one culture has a monopoly, or even necessarily more kinds of adaptive improvements, and what is selectively advantageous for one may be simply ruinous for another. Nor are those cultures that we might consider higher in general evolutionary standing necessarily more perfectly adapted to their environments than lower ones. Many great civilisations have fallen in the last 2000 years even in the midst of material plenty, while the Eskimos tenaciously maintain themselves in an incomparably more difficult habitat.

THE GENERAL PERSPECTIVE ON CULTURAL EVOLUTION HAS BEEN LABELLED 'UNIVERSAL EVOLUTION'. IT HAS A NEGATIVE CONNOTATION IN THIS FIELD BECAUSE IT SUGGESTS THE SEARCH FOR BROAD GENERALISATION.

CORRELATIVELY, UNIVERSAL EVOLUTION IS CRITICISED ON THE GROUNDS THAT IT IS SO GENERAL AS TO BE VAGUE, OBVIOUS, OR SIMPLY TRUISTIC (Steward 1955).

4.8 REVIEW AND APPLICATION IN ARCHITECTURE

The principle meaning of ecology, according to the school of cultural ecology, is adaptation to environment. The school emphasises the role of the physical environment as one powerful factor to influence people's culture. Hence, the interaction of physical, biological and cultural features within a unit of territory is the ultimate objective of the concept of cultural ecology. A culture, accordingly, is made up of the energy system, artifacts, the organisation of social relations, the modes of thoughts, the ideologies and the total range of customary behaviour, all of which have been influenced by people's adaptation to their environment. Culture is transmitted from one generation to another by a social group and enables it to maintain life in a particular habitat.

Building forms, patterns of growth, town morphology, in short, the architectural phenomenon, has been elaborated on in an accumulative way. Like culture, the adaptive processes to ecology have led man to create specific techniques, have facilitated certain modes of architectural thought and established choices that are more fit to a group of people occupying a particular habitat.

It follows that designing for any social group involves an awareness of their physical setting which has largely shaped their customary behaviour, way of living, social context rather than those cultural and acculturative features. In that, the concept of cultural core presented by J. Steward can be best considered as an empirical approach for distinguishing between different cultures.

It is quite agreeable that many basically different cultures exhibit many similar cultural features (secondary features). These are more remote from subsistence activities and usually form a body of abstract and merely aesthetical values. IT IS HENCE SUGGESTED IN THIS STUDY THAT IMPLEMENTING SUCH ABSTRACT AND HIGH CULTURAL FEATURES IN DESIGN WILL INEVITABLY LEAD TO ERRORS AND PRODUCE MISFIT SOLUTIONS. ALTERNATIVELY, A REFERENCE TO FEATURES MORE CLOSELY RELATED TO ESSENTIAL PHYSICAL CONDITIONS, AND TO ACTIVITIES OF SUBSISTANCE SUCH AS THE ECONOMICAL, BIOLOGICAL, PHYSICAL, ETC. WILL EVOLVE SOLUTIONS MORE RELATED TO ITS CONTEXT. It is not necessary to mention that often in such circumstances the opportunity to develop aesthetic characteristics of the designed objects will remain widely opened. That is, the most appreciated characteristics of the vernacular or traditional buildings are so because of their physical performance and function, and in accordance with the requirements of the cultural core in the first place.

In a later chapter we will elaborate on the study of the development of the prototypical architectural patterns which were evolved to function within the activities of the cultural core and acquired their aesthetical and social implications during various historical stages (Article 9.4.2).

Chapter Five

COGNITION

The Acquisition, Organisation and Use of Knowledge

Chapter Five

COGNITION

5.1 INTRODUCTION

The aim of this chapter is to define the role cognitive structure (various types of schemata) plays in guiding the process of unself-conscious design, whether historically or at the present time. It is also to demonstrate how such structure can be employed in the elaboration of all high and self-conscious designs.

While commencing with such an intricate task, it was decided that it is necessary to make regular reference to cognitive psychology - its basic concerns, concepts and theories - whenever needed so that the study's own view would fit properly with the scientific framework of this very complex subject.

5.2 COGNITION

Ulric Neisser defines cognition as the activity of knowing: the acquisition, organisation, and use of knowledge. John Flavell suggests that although it is important to communicate ideas about the nature of cognition, it is neither possible nor desirable to define it and limit its meaning in any precise or inflexible fashion (J. Flavell 1985). He stated that the traditional image of cognition tends to restrict it to the 'intelligent' process and products of the human mind. This image, he added, includes such higher-mental-process types of psychological entities as knowledge, consciousness, intelligence, thinking, imagining, creating, generating plans and strategies, reasoning, inferring, problem solving, conceptualising, classifying and relating, symbolising, and perhaps fantasising and dreaming. While any of these activities

cannot be excluded, it might be that some would feel it necessary to add others. Certain activities would have a somewhat humble, less purely cerebral-intellectual case according to some psychologists. Perception, imagery, memory, attention and learning are possible cases in point. Once embarked on such a broadening course, one is finally led to ask what psychological processes cannot be described as 'cognitive' in some nontrivial sense. The answer is that mental processes habitually intrude themselves into virtually all human psychological processes and activities and consequently there is no really principled place to stop. In fact, Flavell is reluctant to include in his study such 'non-cognitive-sounding things' as emotions, personality, aggression and so on. What one knows and thinks (cognition) obviously interacts in a very substantial and significant way with how one feels (emotions). If there is no nonarbitrary place to stop once we go beyond a narrow, purely higher-mental-process image of cognition, why go beyond it at all? Flavell asked this question and his answer was that the processes which go into making up what we call 'thinking', 'perceiving', 'remembering' and the rest are in fact complexly interwoven with one another. Each process is believed to play a vital role in the operation and development of every other process, affecting it and being affected by it. What you know, for example, affects and is affected by how you perceive; how you conceptualise or classify things influences the way you reason about them, and vice versa. The human mind is a very highly organised device. It is not a collection or aggregate of unrelated cognitive components, but rather a complexly organised system of interacting components.

One important view of the nature of development of the cognitive system adopted in this study is that of Piaget. He viewed human cognition as a specific form of biological adaptation of a

complex organism to a complex environment. The cognitive system he envisaged is an extremely active one. That is, it actively selects and interprets environmental information in the construction of its own knowledge rather than passively copying the information just as it is presented to the senses. While paying attention to, and taking account of, the structure of the environment during knowledge seeking, the mind always reconstructs and reinterprets that environment to make it fit in with its own existing mental framework. The mind builds its knowledge structures by taking external data and interpreting it, transforming it, and recognising it. It therefore meets with the environment in the process of constructing its knowledge, and consequently that knowledge is to a degree 'realistic' or adaptive for the organism. However, Piaget made much of the idea that the mind meets the environment in an extremely active, self-directed way. In his summary of the cognitive system, Flavell mentioned that the human mind is conceptualised as a complex system of interacting processes which generate, code, transform, and otherwise manipulate information of diverse sorts. The Piaget model describes how this cognitive system interacts with its environment, and, by means of many such interactions, undergoes developmental change. According to this model, the cognitive system plays a very active role in its cognitive interchanges with the numerous experiences in its milieu, rather than simply making a mental copy of what is experienced. Each cognitive encounter with the world always has two aspects, assimilation and accommodation. Assimilation essentially means interpreting or construing external data in terms of the individual's existing cognitive system. What is encountered is cognitively transformed to fit what the system knows and how it thinks. Accommodation means taking account of the structure of the external data. Therefore, the cognitive system

simultaneously adapts reality to its own structure (assimilation), and adapts itself to the structure of the environment (accommodation). By repeatedly attempting to accommodate and assimilate novel, previously unassimilated environmental elements, the system itself gradually changes its internal structure; that is, cognitive development takes place.

Another different view has regarded much of cognition as consisting of a sequential series of processing stages (M.W. Eysenck 1984). When a stimulus is presented, basic perceptual processes occur, followed by attentional processes that transfer some of the products of the initial perceptual processing to a short-term memory store. Thereafter, rehearsal serves to maintain information in the short-term memory, and some of that information is transferred to a long-term memory store. Accordingly, it is possible to follow the stimulus input from the sense organs to its ultimate storage in the long-term memory by means of successive studies on perception, attention, short-term memory, and long-term memory.

The problem with such a view is that it cannot readily accommodate other cognitive activities, such as thinking or problem solving. In particular, Eysenck suggests that the model appears to make the erroneous assumption that stimuli impinge on an inactive and unprepared organism. In fact, while processing is substantially affected by the nature of presented stimuli, it is also crucially affected by the individual's past experience, expectations, etc.

Matters can be clarified by reference to a distinction that is often made between bottom-up or stimulus-driven processing and top-down or conceptually-driven processing. Bottom-up processing refers to processing directly affected by stimulus input, whereas top-down processing refers to processing affected by what an individual brings to a stimulus situation. Eysenck suggests, as

an example of top-down processing, it is easier to perceive the word 'well' when poorly written if it is presented in the context of a sentence: "I hope you are quite . . .", than when it is presented on its own. According to certain contemporary schools of thinking, what normally happens is that cognitive activity comprises concurrent and interactive bottom-up and top-down processes. Finally, in spite of the fact that cognition typically involves an amalgam of bottom-up and top-down processing, it is still true that the relative importance of these two kinds of processing varies considerably from one cognitive activity to another, and from one task to another.

5.3 COGNITION AND PERCEPTION

The relation between cognition and perception has been tackled differently by psychologists. On one hand, Roger Hart and Gary Moore (1970) suggested that an important distinction should be made between cognition and perception. Cognition, they stated, by lay definition held to include all the modes of knowing (perceiving, thinking, imagining, reasoning, judging, remembering, etc.), would seem to include perception. Piaget (1970/1977) and his followers suggested that knowledge of the world includes two aspects: one of which is essentially figurative, related to the percepts or images of successive states or momentary configurations of the world by direct and immediate contact. The second is essentially operative, related to the operations which intervene between successive states and by which the subject transforms parts of the world into reconstructable patterns of schemes: visual perception is only one form of figurative knowing, while cognition is based on the operative mode. Another related view treats perception as a subsystem of

cognition. In this view, knowledge about the world may be constructed by many means, perceptual judgement being only one. As development proceeds, perception becomes subordinated to higher mental processes. Cognitive structures available to the organism influence perceptual selectivity which leads to a reconstruction of the world through selected fields of attention: perception is thus both a subsystem of cognition and a function of cognition. Perception and cognition, therefore, are two separate but reciprocating processes (Wapner 1969).

Along this line are Rapoport's studies (Rapoport 1977). He suggests that a very useful distinction between perception and cognition is based on the role of indirect knowledge, messages and information from the media, in cognition. Through this non-experiential means people know and evaluate places which they have never seen. Perception is more sensory, more related to direct experience, and involves the individual in the specific environment. For example, perceived distance is an interval between points seen simultaneously, whereas cognitive distance is the distance estimate made in the absence of objects, relying more on memory, stored impressions and the like. Cognition is thus more intellectual than perception (Brown and Moore 1971).

Rapoport's suggestion is that there are four processes involved:

- 1) The perceptual process, although it involves some measure of cognition and memory;
- 2) The encoding process, stressing memory, learning, imagery and some values which are mainly cognitive;
- 3) The affective processes of preference and evaluation, leading to
- 4) Action.

On the other hand, there is the view that considers both perception and cognition as one system which is part of a larger system whose fundamental function is the processing of information

(W. Ittelson 1973). Ittelson suggested that more and more activities formerly considered to be exclusively the province of cognitive functioning are being shown to be inseparably a part of perception as well. What used to be considered simple sensory discrimination is now considered in detection theory to involve complex judgements subtly influenced by such apparent features as the individual's value hierarchy. One best example of such activity in which the connection between perception and other psychological processes is so clear is memory.

5.4 PERCEPTION

How do people acquire and process information about their environments? Obviously this happens through the various sensory modalities - vision, hearing, smell, touch, taste and kinaesthesia. According to Rapoport, before cues can be understood they must be noticed; before the social significance of elements can be assessed they must be perceived; before messages - whether signs, buildings, areas or locations - can be evaluated they must be discriminated from noise. Perception is then the most fundamental mechanism linking people and environments. It is the most direct and immediate sensory experience of the environment (Rapoport 1977).

Every organism lives out its day in relation to, and as part of, a larger environmental context. All but the most primitive organisms receive information from this context through sense organs and process it, together with information from other sources, in a nervous system (Ittelson 1973). The reception and processing of information from the environment constitutes the area of study designated as perception. All studies concerning perception have implicitly recognised that it is important because it is the source

of information about environment - which is intimately related to the adaptive functioning of the organism.

One may start by asking "why do organisms have sensory receptors, and what is the function of sensory reception in the total behaviour of the organism?" Ittelson stated that at lower levels, sensory reception is limited largely to the avoidance of noxious situations and the approach to nurturant ones. As organisms grow more complex, sensory reception enters into many other functions: distance reception, identification, communication, sexual attraction, and more complex social interrelationships. In man, this trend is accentuated and perception, in addition to these functions, acquires relevance to many other processes far removed from the adaptive significances observable at lower levels, for example, language and aesthetic experience. Furthermore, the predictive function of perception becomes quite explicit.

It might be most appropriate to begin with a consideration of the concept of perception. While perception is an activity importantly influenced by sensory information, there is no consensus regarding its definition. Levine and Shefner (1981) suggested that "perception refers to the way in which we interpret information gathered (and processed) by the senses." In a word, we sense the presence of a stimulus, but we perceive what it is. This process of interpreting sensory information is complex and involves a considerable variety of processing mechanisms (M.W. Eysenck 1984). At the very least, perception depends upon basic physiological systems associated with each sensory modality, together with central brain processes that integrate and interpret the output from these physiological systems. Hence it is suggested that perception itself depends on the skill and experience of the perceiver; on what he knows in advance (Neisser 1976).

Not only reading but also listening, feeling and looking are skillful activities that occur over time. All of them depend upon pre-existing structures, here called schemata, which direct perceptual activity and are modified as it occurs. Perceiving does not require remembering in the ordinary sense, but it is an activity in which both the immediate past and the remote past are brought to bear upon the present. Recall of past experience is also such an activity, as are imagining, speaking, thinking and every other form of cognition.

5.5 THEORIES OF PERCEPTION

There are two main sources of information which can be used in the attempt to perceive the external world accurately (M.W. Eysenck 1984): 1) currently available sensory information, and 2) relevant past knowledge and experience stored in the brain. There has been much controversy over the relative importance of these two factors. The first school emphasises the role played by stimulus information in perception, well demonstrated in studies presented by Gibson (Gibson 1950, 1966, 1979). According to Gibson, we are able to perceive surfaces at different slants, or in depth, as a result of using information from visual stimulation concerning the gradient of texture density. These gradients, and expansion in space, vary according to the angle of sight; they illustrate some of the information inherent in the optic array that can be used to provide an observer with an unambiguous spatial layout of the environment. He stated also that "a great many properties of the array are lawfully or regularly variant with changing observation points"; this means that in each case a property defined by the law is invariant. Concerning the meaning of objects, Gibson rejected the conventional view that percepts become meaningful

as a result of the involvement of relevant knowledge. He argued instead that all the potential uses of objects are directly perceivable (Ittleson 1973). Gibson's theory of perception does not begin with the retinal image. It starts with the pattern of ambient light, reflected from objects, which is available to be sampled at any given point in space. The complex structural properties of this optic array are determined by the actual nature and position of the objects. This structure specifies those objects; the information about them is in the light. When the observer or the object moves, certain higher-order characteristics of the optic array remain invariant while others change. These invariants, over time, specify the layout of the environment still more precisely. The observer perceives simply by picking up these invariances. He may have to search for information but he need not process it, because it is all in the light already (U. Neisser 1976).

Neisser believes that Gibson's view has certain striking advantages over the traditional one. The emphasis on the pickup of information over time makes the theory applicable to haptic (touch-relevant) and acoustic information as well as light, at least in principle.

Neisser criticises the theory, on the other hand. He stated that despite these strengths, the theory remains unsatisfactory in certain respects. Most obviously, he added, it says nothing about what is in the perceiver's head. What kinds of cognitive structure does perception require? How do perceivers differ from one another? What happens when we choose what to see or how do we learn to see better? How are illusion and error possible if perception is simply the pickup of information that is already available and specific? How are we to conceive other cognitive processes - imagery, memory, thought?

A radically different approach has been favoured by several theorists, including Neisser. In essence, they regard perception as an active and constructive process; perception is not directly given by the stimulus input, but occurs as the end-product of the interactive influences of the presented stimulus and internal hypotheses and expectations. There are several phenomena indicating that at least some perceptual representations are not constructed solely on the basis of information from the current physical input, but make use of stored information.

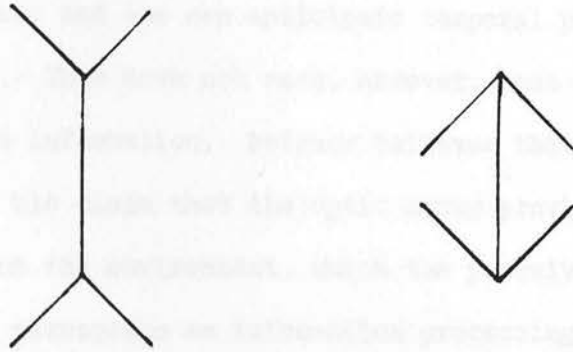
An experiment carried out by Warren and Warren (1970) provided a striking demonstration of the ways in which stored knowledge can affect perception. Twenty people were presented with one of the following sentences; the asterisk indicates a deleted portion of the sentence:

- 1) It was found that the *eel was on the axle.
- 2) It was found that the *eel was on the shoe.
- 3) It was found that the *eel was on the table.
- 4) It was found that the *eel was on the orange.

The way in which the crucial element in the sentence (i.e. *eel) was perceived was much affected by sentence context. Subjects listening to the first sentence tended to hear 'wheel', those listening to the second sentence heard 'heel', whereas those exposed to the third and fourth sentences heard 'meal' and 'peel', respectively.

On the other hand, the school of the constructive theorists can explain many of the classic visual illusions in a general way, by assuming that previous knowledge derived from perception of three-dimensional objects in space is applied inappropriately to the perception of two-dimensional figures. For example, people typically see a given object as having a constant size despite variations in the retinal image by taking account of its apparent

distance; the further away from the observer that an object is, the smaller will be its size in the retinal image. In the Muller-lyer illusion (see the figure), the vertical line in the figure on the right appears smaller, although they are in fact of the same length.



The Muller-lyer figures can be regarded as simple perspective drawings of aspects of three-dimensional objects. Thus the figure on the left can be thought of as the inside corner of a room, and the figure on the right as the outside corner of a building. In other words, the outgoing fins represent lines approaching us, whereas the ingoing fins stand for lines receding into the distance. Thus the vertical line on the left is in some sense further away from us than the vertical line on the right. Since the retinal images of the two vertical lines are the same size, the implication of size-constancy scaling is that a more distant line of the same retinal size as a less distant line must actually be longer, and that is the Muller-lyer illusion (M.W. Eysenck 1984).

Ulric Neisser's view is that cognitive structures crucial for vision are the anticipatory schemata that prepare the perceiver to accept certain kinds of information rather than others and thus control the activity of looking. Because we can see only what we know how to look for, it is these schemata (together with the information actually available) that determine what will be perceived. The schema assures the continuity of perception over time in two

different ways. Because schemata are anticipations, they are the medium by which the past affects the future; information already acquired determines what will be picked up next (U. Neisser 1976). In addition, Neisser suggested that some schemata are temporal in their very nature, and one can anticipate temporal patterns as well as spatial ones. This does not mean, however, that we cannot pick up unanticipated information. Neisser believes that Gibson is surely right in his claim that the optic array provides accurate information about the environment, which the perceiver picks up. Those who treat perception as information processing are also right: complex mechanisms in the brain are involved in accepting this information. So, too, is a third group of theorists who have described perception as the testing and confirming of hypotheses. Each of these views has focused on a single aspect of what is normally a continuous and cyclic activity.

5.6 PERCEPTION AND ARCHITECTURE

Roger Scruton argued that "to describe architectural experience is to describe the basic processes of perception. Beyond the suggestion that without perception an architectural experience might not exist in the first place, is a valid argument" (R. Scruton 1979). Scruton stated that what is peculiar to architecture comes, not from the experience of perception, but from the enjoyment that depends upon it. What is in question is the pleasure that an actual experience produces. There is an important distinction between sensuous pleasure, such as the one induced by taking a hot bath, and an aesthetic pleasure, such as that which comes from hearing music or experiencing an architectural work. Architectural pleasure is governed by a conception of its object. This means that one has to know the orders if one is to enjoy full pleasure

in Roman building; one has to know the use of a building to enjoy it properly. THERE IS NO SUCH THING AS A PURE, UNMEDITATED SENSUOUS PLEASURE IN BUILDING. On the other hand, one may ask if there was any distinct line between sensuous and intellectual pleasure. The meat loses its relish when we learn that it is the flesh of a favourite dog. Hence perceptual pleasure of objects and architectural works vary according to the thoughts with which we approach them. Although perception of architectural work may involve an act of attention - some kind of intellectual apprehension of the object - it is the immediate impulse of cognitive schemata rather than personal attitudes which defines what induces perceptual pleasure. HENCE, THE BUILDING IS NOT MERELY THE CAUSE OF PLEASURABLE SENSATIONS, BUT THE OBJECT OF PLEASURABLE SENSATIONS, WHICH IS THE CONGRUENCY WITH SCHEMATA.

5.7 PERCEPTION INTENSITY

Perception intensity might be defined as the level and intensity of sensational and thoughtful attention an individual pays when exposed to an object or event. It is largely influenced by three factors.

The first is OBJECT FUNCTION. Here, the assessment of the extent to which an object provokes an image in the observer depends largely on its function. It is important also to mark the kind of function that an object implies. That is, as far as an object exists within a physical fabric it is not necessary that it performs the same function for different people. Although non-physical implications of an object are implicitly included within its function, the more clear the physical performance, the more effect it has on the observer's perception. Hence the ecological condition of an object, that is to say its physical appearance, the economical

and biological conditions, etc., can communicate the strong and clear meaning necessary for perception. Perception intensity, therefore, depends on how much a physical form conforms to the activity it performs. The more form and activity are exposed and congruent, the more intensive is their perception. It is quite clear that function implies two aspects, one is external and includes physical and manifest performance usually to prevent unwanted acts, etc. The other aspect is hidden and depends on the individual's own values and on how much an object is useful to him. These values may often reflect his attitude towards the world, history and societies, and hence may form his cultural interest.

The second factor is FAMILIARITY. This has been considered as a response decrement resulting from repeated stimulation (J. Mackworth 1969). When there is a significant degree of unfamiliarity, the object is observed with concentrated awareness, so an immediate response is made if the situation becomes threatening (P.F. Smith 1979). The second time an object is observed, the arousal increment is lower and so-on. This comes from the fact that a major function of familiarity is to concentrate on things which directly affect the security so that irrelevant information offering no threat may not slow the decision-making process.

We have seen that generally cognitive mental processes influence perception (Neisser 1976). Therefore it is suggested that visual milieu which feature environmental performances (functional aspect), for example, induce a feeling of security due to an immediate knowledge of the milieu provided by cognitive schemata which have previously experienced the situation as non-threatening. As a result such instances where the native qualities of building materials, i.e. structure, colour, texture and so-on are dominant,

a feeling of security is induced immediately, which requires no act of thoughtful observation. This is a fact which is commonly extended to include various situations, events, elements, and patterns within the perceived environment that have been experienced and hence stored in the brain. One can, no doubt, suggest that by the use of such elements and situations already stored in the brain, very many new ideas can be elaborated which fit any modern situation and still cognitively achieve people's appreciation.

On the other hand, one important feature of aesthetics is the element of surprise which provides the maximum arousal increment and leads to the enjoyment of the architectural experience. But after the first encounter, the perceptual impact of a particular visual milieu is never the same. The argument is that aesthetic or perceptual impact can be increased by a knowledge of the problems which the builder has overcome, and the issues he has elaborated in his artefact. Furthermore, and most importantly, an individual appreciates a building not because of its mere individual qualities but as a result of its cognitive real values. A perception of a building may involve many cognitive mental processes. These processes are recalled in certain instances or occasions, and may require as long a time as one might imagine; for the human experience is constructed by a complexity of knowledge, a sequence of stimuli and a series of interacting mental images. It is true that a cognitive response is achieved immediately because cognition is not remembering, but the pleasure of perceiving such an event may last for as long as the human is disrupted from the natural resources of his cognitive processes and as long as he is in an act of perceiving them.

The third major influence on perception is that of ASSOCIATION.

The individual and the environment form a system, and their mutual interaction is partly determined by the physical environment and partly by the individual's psychology and his own interpretation of it together with its significance. It follows that perception is affected by the nature of the stimuli, the physiology of perception and the state of the organism - expectation, attention, motivation, selectivity or adaptation are all affected by association with previous experiences. Perhaps one major effect of association is that it makes people of different cultures perceive the environment in the same way. A setting can only be conceived as suitable for a specific activity and as having some meaning after it is perceived as a physical setting. Associational meaning may be more important than concrete or even usage meanings. Implicitly, continuity of physical pattern is associated with permanence of the environmental adaptation rather than conceptions.

The distinction between perceptual and associational worlds may help explain why natural scenes seem to be greatly preferred to urban scenes (Rapoport 1977). The preference for natural over man-made is due to a set of associational values attached to nature so that design characteristics within urban milieu are not used to discriminate between the two sets, rather, associational descriptions are used. Another function of associational meaning is demonstrated through the congruence between form and activities which depends on three aspects of environmental knowledge: type, intensity and significance (Steinitz 1968). All are part of the perceptual environment, but depend on associations. Clearly this explains why people do not tend to prefer modern shopping complexes. Although they comprise various activities, people are still used to perceiving those activities in association with their own forms

as in small scale shopping centres and markets. These small shopping areas attract people, not because of their design quality, but due to their associational meanings which are lacking in large shopping centres.

Yves-François Le Moine, 'Theory of Environmental
Quality Based on People's
Significant Concepts'

SCHEMATIC APPROACH TO DESIGN

**Towards New Theory of Environmental
Quality Based on Meeting People's
Cognitive Schemata**

S C H E M A T I C A P P R O A C H T O D E S I G N

6.1 INTRODUCTION

In this important part of the study, an attempt is made to approach cognitive structure from a relatively new point of view, more applicable to environmental design. It presents an explanatory mode of thinking for the phenomena of architectural continuity and the way people design, respond and react to their built environment. As we have seen in the beginning of this chapter, most, if not all, psychological theories of cognition consider that there are two main resources of information that can be used in the attempt to perceive the external world and which construct the cognitive schemata. These are: 1) currently available sensory information gained from the object; 2) relevant past knowledge and experience stored in the brain. Although there has been much controversy over the relative importance of these two factors, many modern theorists tend to favour a blend of the two approaches. The view offered here, which sets the central investigation of this chapter, suggests that there are also perceptions of objects and events which are not determined either by object information or by past experience stored in the human brain. Examples of such events will be explicitly cited and discussed later. For instance, both theories do not provide an explanation for the ability of all human beings to perceive and react similarly with the absence of previous knowledge to such events as the smell of earth after rain; the scene of an arch disregarding its materials and its context; a wall revealing authentic properties of its construction material, and so on. It seems necessary to either induce some modification on the previous

two theories or to attempt an investigation for further resource of perceptual information.

Many studies of cognition (see Ulric Neisser 1976; Michael Eysenck 1984; John Flavell 1985; William Ittelson 1973; Harold Proshansky 1970; George Mandler 1985) have stated that the effects of experience on perception development are increasingly potent and specific. Experience over time leads to clearer and more accurate schemata (Rapoport 1977). Ulric Neisser suggested that cognitive schema assures the continuity of perception over time in two different ways. Because schemata are anticipations, they are the medium by which the past affects the future; information already acquired (experience) determines what will be picked up next (U. Neisser 1976). It is clear, accordingly, that richer perception is achieved only when possessing a previous knowledge of the object or when the object impinges strongly on the observer's brain. The argument presented by the concept of stored information is that experience plays a key role in most contemporary theories of memory. The brain functions essentially like a large library system. In that view, traces of individual past experiences are stored in the library stacks (long-term memory) and occasionally retrieved for conscious re-examination. If the librarian once fails to locate them, forgetfulness occurs. One can argue that if perceiving often depends upon how much the brain retrieves from the stored information how is it possible to explain those instances which have not been previously experienced, yet a full perception occurs? How is it possible to explain the relative similarity of reactions to the effects produced by objects and events which people of various temporal and spatial belongings perceive? It might seem, for a while, that there are some inborn biological factors which provoke this similarity of reactions. But this cannot be the

case. For the biological determinants are just one set among a larger set of factors which affect perception.

The concept of stimuli information had its first application in architectural research when Lynch's experiment implied that visual images determine people's response to their environment. However, the concept of object information has been criticised for the seclusion of meaning and also for the difficulty of explaining other mental processes such as imagining, problem solving, dreaming and so on. The concept is bound to be misleading, Neisser suggested. It implicitly suggests that the function of perception is to inform us about things as mere objects: geographically and physically defined chunks of matter that are what they are whether we look at them or not. This is true, but it is far from being the whole truth. In the normal environment most perceptible objects and events are meaningful. They afford various possibilities for action, carry implications about what has happened or what will happen, belong coherently to a larger context, possess an identity that transcends their simple physical properties (U. Neisser 1976).

Similarly, Lynch's view was also criticised for the very reason of discarding meaning and other factors such as the cultural and social which were proved to influence people's perception of their own cities (Gulick 1963). On the other hand, the concept of stored experience, when applied alone, has a very serious implication in architecture. It implies that if one imagined that a certain generation was, for some reason, interrupted from the previous experience of past generations, then there would appear a sort of chaotic interaction with the environment. A consequence of such an assumption would be that builders and designers might tend to produce inharmonious and disintegrated forms of buildings due to lack of consensus perception structure. Similarly, it would imply

that after any natural disaster or extreme revolutionary event, for example, there would be a drastic discontinuity with the past. It is difficult to assume the validity of such an assumption. History has witnessed many instances when societies maintained cultural continuity even when drastic changes occurred. This would inevitably lead us to the following conclusion: BEYOND BOTH THE FLOW OF AN OBJECT'S INFORMATION AND STORED EXPERIENCE, BEYOND THE EFFECTS OF VARIABILITY OF CULTURAL SCHEMATA AND HISTORICAL EVENTS, LIES A PERMANENT AND INNATE COGNITIVE EQUIPMENT (SCHEMA) INBORN WITH ALL ORGANISMS. IT ACTS UNIVERSALLY AND ITS CHARACTERISTICS STEM FROM THE VERY FACT THAT ALL OBJECTS AND ORGANISMS ARE OF THE SAME ESSENCE (ARTICLE 3.7).

Before we embark on the presentation of further studies of this particular schema as well as the other schemata, and before we talk about their functions of guiding design processes, I find it necessary to introduce in general the concept of cognitive schemata. The study will be again based on recent publications in the field of cognitive psychology.

6.2 SCHEMATA

Neisser defines a schema as that portion of the entire perceptual cycle which is internal to the perceiver, modifiable by experience, and somehow specific to what is being perceived. He suggests that the schema accepts information as it becomes available at sensory surfaces and is changed by that information; it directs movements and exploratory activities that make more information available, by which it is further modified (U. Neisser 1976). From the biological point of view, a schema is a part of the nervous system. It is some active array of physiological structures and processes: not

a centre in the brain, but an entire system that includes receptors and afferents and feed-forward units and efferents.

The functions of schemata may be clarified by some analogies, Neisser stated. In one sense, when it is viewed as an information-accepting system, a schema is like a format in a computer-programming language. Some information is accepted. Other information will be ignored or will lead to meaningless results. But a schema also functions as a plan. Perceptual schemata are plans for finding out about objects and events, for obtaining more information to fill in the format. Schema determines what is perceived even where no overt movements occur (e.g. listening), because information can be picked up only if there is a developing format ready to accept it. Information that does not fit such a format goes unused. Perception, Neisser believes, is inherently selective. If the right sort of information is available, the schemata will accept it, and may direct movements to search for more. BUT ORGANISMS HAVE MANY SCHEMATA, RELATED TO EACH OTHER IN COMPLEX WAYS.

The schema at any given moment resembles a genotype rather than a phenotype. Perception is determined by schemata somewhat in the same sense that the observable properties of organisms are determined by their genes: it results from the interaction of schema and available information.

Rapoport suggested that one major characteristic of cognitive schemata is that they include areas and places never experienced but known indirectly. The accuracy of such knowledge, he believes, depends on education, the accuracy of the data, skill at interpreting it, and so on. Direct experience over time leads to clearer and more accurate schemata. In his introduction to the concept of schema, Eysenck suggested that it is also worth considering the possibility that we possess rather larger, well-integrated chunks

of knowledge. These larger chunks facilitate our understanding of complex communications, and they also allow us to behave appropriately in various situations (M.W. Eysenck 1984). It is assumed that schemata consist of organised structures of stereotypic knowledge. They exist as a result of extracting the common elements from a range of situations or events. Rumelhart (1980), provided the following definition of the 'schema' construct:

"A schema, then, is a data structure for representing the generic concepts stored in memory. There are schemata representing our knowledge about all concepts: those underlying objects, situations, events, sequences of events, actions and sequences of actions. A schema contains, as part of its specification, the network of interrelations that is believed to normally hold among the constituents of the concept in question. A schema theory embodies a prototype theory of meaning. That is, inasmuch as a schema underlying a concept stored in memory corresponds to the meaning of that concept, meanings are encoded in terms of the typical or normal situations or events that instantiate (provide concrete examples of) that concept".

Especially important schemata relate to our knowledge about the spatial relations between objects and about their locations in the physical environment. Psychologists coined the term 'cognitive map' to refer to the structure in which such information is held, and there appear to be many kinds of cognitive maps which enable us to drive, walk, and so on. We will discuss this topic after we study kinds of schemata which are involved in the perceiving, evaluating and designing of built environments.

6.3 ORIGINS OF SCHEMATA

Gibson defines perception as the process by which we obtain firsthand information about the world around us (E.J. Gibson 1969). The suggestion is that perception has a phenomenal aspect: the awareness of events presently occurring in the organism's immediate

surroundings. It also has a responsive aspect; it entails discriminative, selective response to the stimuli in the immediate environment.

One may ask about the origin of that 'process'; that 'awareness'; that discriminative, selective response (J. Flavell 1985). Historically the answers to these questions have ranged from those of extreme nativism to those of extreme empiricism. Is our perceptual knowledge of objects, events, and space provided by initial, in-born biological 'nature' (nativism), or is it the product of years of postnatal psychological 'nurture' (empiricism)? It might be available right at birth or it might require a shorter or longer period of biological maturation to become completely functional; in either case, the extreme nativist assigns no developmentally formative role to experience. Alternatively, the organism might begin with the classical empiricist's blank slate, and have to construct all perceptual abilities and knowledge through countless experiences with the external environment.

John H. Flavell suggested that neither view is correct. According to him, all perceptual processes are mediated by biological structures evolved by the species and inherited by the individual. He stated, that, conversely, these structures usually require some sort of sensory input from the world if the processes are to function and develop.

From my readings of the various views and theories of cognitive psychology, I found Flavell's view the most commonly adopted among the modern theorists. Although some modifications can be found, they all end with the emphasis on both the possession of biological structure and the role of experience and sensory input in promoting and developing the cognitive structure. It is also adopted and accepted by this study for its significant implications particularly

in the explanation of environmental input as well as cultural schemata in design. THE ONLY BUT MOST IMPORTANT OBSERVATION HERE IS THAT NONE OF THESE VIEWS EITHER MADE REFERENCE TO OR ATTEMPTED TO POINT OUT WHAT MAKES THIS BIOLOGICAL STRUCTURE RESPOND SIMILARLY TO CERTAIN SITUATIONS, ESPECIALLY WHEN INVOLVING ELEMENTS AND EVENTS IN NATURE WHICH HAVE NEVER BEEN EXPERIENCED BEFORE. IT IS NOT NECESSARY TO RECALL THE MANY ATTEMPTS TO EXPLAIN WHY THIS COGNITIVE STRUCTURE RESPONDS IN DIFFERENT WAYS TO VARIOUS ENVIRONMENTAL AND CULTURAL STIMULI WHICH HAVE BEEN PREVIOUSLY EXPERIENCED.

It is not my intention to attempt any explanation for such situations, because of lack of sufficient background and knowledge of methods of cognitive psychology. Alternatively, examples and employment of these situations are found more useful, hence the issue of fitting this attempt with cognitive psychology is left to the experts!

6.4 TYPES OF SCHEMATA

Organisms have many schemata, related to each other in complex ways (Neisser 1984). The larger schema often determines or motivates the activity of those other schemata embeded within it. Neisser suggested that it is worth noting that the activities directed by two schemata can come into conflict, or even be entirely incompatible.

My suggestion is, that while there is some compatible cognitive attitude among different cultural groups toward some phenomena, there are also major differences among various groups which have different cognitive styles stressing different elements and sensory modalities and organising them differently (Rapoport 1977). There could be a lack of common schema due to a non-homogeneous population which is also modernising rapidly with the disruption of cognitive rules. Cognitive schemata exist and they vary among different groups.

These schemata are based on experience and knowledge and on names and categories which reflect cognitive style. Physical and non-physical factors are involved - the nature of the environment, cues in all sense modalities, meaning, value, culture, symbolism, preference and activities, use and other schemata (Stea and Wood 1971). In the case of cities, schemata have clear spatial expression in the form of mental maps. Spatial schemata not only locate people in space and control behaviour, they also organise and order incoming information acting on filters and resisting change. Inconsistencies are ignored, but shifts occur when the weight of inconsistent information is too great. Rapoport believes that schemata depend on a classification process and hence on naming, and are related to preference and evaluation of particular places, groups and symbols, so that behaviour is related both to preference structures and spatial schemata (Rapoport 1977). However, the various elements incorporated into schemata are selected on various grounds and fitted into categories and schemata which vary with culture, the environment and personal characteristics related to education, place of residence, familiarity, activity systems and so on.

This study has considered that cognitive structure is the leading element in the determination of environmental quality; its meanings, evaluation, and most importantly in the understanding of its clues and messages. The environment by itself is a mere physical object, and it is meaningful only to the extent that people's schemata shape its cultural, social, aesthetical and any other meaningful aspects. Obviously, then, we ought to investigate these values, not within the external and materialistic features of any culture, but within the schematic structure which, as part of its nature, embodies these features. Such a method, no doubt, makes accurate the task of recognising people's preferences of the most

satisfactory environmental qualities; and hence setting the most appropriate design characteristics. THE DEMONSTRATION OF THE PROCESSES IN WHICH COSMOLOGICAL, ECOLOGICAL AND CULTURAL FORCES SET OUT THE COGNITIVE STRUCTURE AND ITS INTERPRETATIONS OF THE ENVIRONMENTAL ACTIONS IS ONE CENTRAL ISSUE IN THIS STUDY.

We may have noticed that most studies of cognitive psychology deal basically with mental processes, cognitive mechanisms; and the development of cognitive knowledge. There have been only a few and scattered studies, mostly accompanied by a great amount of confusion, that dealt with these issues within the architectural context. It seems it would have been a great contribution to the study of the nature of design if there were a sufficient and clear tackling of this matter by a prominent cognitive psychologist. We should mention, of course, those attempts undertaken by Amos Rapoport. But it would be unfair not to state that these studies have generally failed in reality to present a clear and consistent conception about the accurate mental activities implied in design activities. I would suggest that only a theory of cognition can present a conclusive and permanent answer to the whole set of environmental controversies with which most architectural theorisations have been engaged. THE SIMPLE ASSUMPTION TO SUPPORT THIS SUGGESTION IS THAT A GENUINE ENVIRONMENTAL DESIGN IS AN ENTIRELY PURE PRODUCT OF AN UNDISRUPTED COGNITIVE SCHEMATA.

6.5 A COGNITIVE APPROACH TO ARCHITECTURAL DESIGN

It is hoped that Chapter Five has enabled us to be aware of what cognitive psychology is. It is hoped also that we are now able to proceed further in dealing with cognition in relation to a basic and central issue in the whole field of architecture.

It is the 'Nature of Design' which concerns almost all architects, architectural theorists, and critics, as well as possibly many non-architects.

It might not be necessary to recall that the interest in this vital issue has demonstrated itself recently through the adoption of immense abstract frameworks of theories and concepts, views and profound philosophical opinions as well as computational approaches. What makes it a little more amazing, and certainly serious, is that present architects, as a matter of "prestige", no longer embark on their designs without the provision of one or more of these 'intellectual' and 'highly cultural' ideas. Examples of such 'events' are evident in the production of eccentric buildings, which lack, among many other things, a simple consideration of the thermal, climatic and other physical conditions. It seems we are getting used to a condition where an intentional ignorance of basic ecological requirements is considered a matter of architectural common sense! Furthermore there is a feeling that a concern to please people by providing them with comfortable premises would seem naive and might cause injuries to the dignity and arrogance of our elite professionals!

There has been, therefore, a dramatic shift in the way that architects conceive of architectural essence. For so many years, architecture has been pure manifestation of the consistency of that one cosmological system which includes the two interacting elements of man and environment. Our present understanding, unfortunately, tends to limit architecture to a mere unconditional product of one interrupted element; a kind of man called 'architect'. A submission of such a kind certainly leads to an extremely significant decrease in our interest in the building activity. It may also adversely affect our aesthetical responses to the built environment in general.

Another way of putting this point involves a preview of man's relation to the constituent elements of buildings. Man was, for the whole preceding history, engaged in gathering materials which he usually obtains from nature. He was fully contented with moulding them into buildings. Because both man and nature form one integrated system, man has accumulated a profound knowledge of these materials embedded deeply in his physiological structure. The point is very important and it is possible now, in the light of this notion, that the innate disposition of man toward natural materials has been extended to include all interactional modes, subsystems and visual structures the materials initiate. All that we are entitled to conclude is that through time, this knowledge has become the mastering element in the human decision making processes concerning choices of built forms and their associated meanings, activities, messages and so on. As a result, man no longer requires a thoughtful act of any kind to enable him to recognise objects, events or structures that involve materials or their associated aspects. For indeed they no longer imply any threat to his biological security. Conversely, modern man is, at present, threatened so often by exotic STRUCTURES made of metal and chemical matters which are extensively foreign to his physiology and are endangering his biological security.

A distinction should here be made. Following the innate disposition of man to nature and the cosmological forces, which provided him with his initial 'cosmocognitive knowledge', came another source of knowledge, that is, experience. In this connection it is important to explicitly carry out a full study of types and resources of knowledge which construct the various cognitive schemata.

6.6 TWO CATEGORIES OF SCHEMATA

I benefited from the continuous flow of ideas of cognitive psychology and essentially from the controversies over the validity of the main theories of perception and origin of knowledge. I was also concerned with the limited application in architecture of these very important studies. Though highly skillful, strongly integrated and very stimulating, I still have the 'feeling' that they lack reference to a very important element in the study. That existing theories of schemata cannot explain many universal architectural processes (examples of which are in the next article) in which man acted and still, beyond the effects of both sensory input or the acquired knowledge by experience.

My observations on world architecture alone have led me to the conclusion that beside the differentiatinal effects of the experiential (ecologically and culturally derived) schemata, there exists a great and universal effect of some kind of non-experiential schemata, that theories of cognition did not yet tackle.

6.6.1 One: Non-Experiential 'Cosmocognitive' Schemata

I have suggested this term to refer to 'the' schemata that organisms, and most certainly superorganisms (mankind), have been innately credited with. There is inborn equipment of a prior nature that bears no actual dependence on sensory information or acquired knowledge by experience. Conversely, for these schemata to function, they may require no learning or training. On the contrary, further sensory exposure and repeated experience of their particular objects or events may not stereotype their impact on perception. Unlike all other schemata, these schemata, when in their normal functioning status, do not involve specific mental

processes such as imagining, problem solving and they most certainly do not involve remembering personal emotions or a feeling of familiarity.

An important characteristic of these schemata is that they best normally function when an organism is in a state of adaptation to moderate natural conditions. The ultimate use of these schemata occurs while an organism is in a state of struggle with conditions of high physical criticality. As it might be anticipated, the more remote an organism is from a critical state which might threaten its survival, the less its behaviour implies activities of the cosmocognitive schemata. This does not mean, as might be understood, that these schemata are fundamentally determined by adaptation to natural or, more broadly, ecological factors. By their very nature cosmocognitive schemata are in a very close and substantial relation to the universe and both are bound to the same laws and systems. Indeed, we have suggested elsewhere in this study that both organism and environment have to be seen as elements of one system, each with properties of its own, yet both hewn from basically the same block. That is, the boundary between man and environment, for example, is an imaginary boundary and not a real one, because both classifications are one in reality (See 3.7). Conceptually, thereafter, cosmocognitive schemata represent that one system - they are the point at which both organism and the universe meet and hence represent its extension in space and time. Most important is that they are always in a process of offering a genuinely spontaneous knowledge which is most adaptive to the organism's immediate natural microcontext at any stage of its biological development. The various authentic capacities of objects which include their material properties and their potential dispositions towards interactions with other objects are all taking precedence in the organism's knowledge structure however

small it might be. In other words, structural, thermal and other behavioural qualities of any substance have a prior presence in the organisms schemata due to the fact that both are fundamentally structured out of the same constituent essence. For example, in many instances, and most certainly among primitive people, a choice of certain material for certain usage is decided instantly in a spontaneous act of the brain and independently from any prior experiential knowledge. Such a decision does not involve an accurate conscious perception or any calculated observation into the nature and attributes of the natural object.

There are many reasons to believe that a human being, by virtue of his intellectual capacities (sophisticated neural system), responds to intrinsic events in nature with a provision of cosmological equipment of knowledge. IT IS THUS OF SOME THEORETICAL SIGNIFICANCE TO CONSIDER THE EXPERIENCE OF THESE EVENTS AS A KIND OF SELF IDENTIFICATION, FOR BOTH EVENTS OF SUCH KIND AND ORGANISM PERTAIN TO EACH OTHER. THEREFORE IT IS THIS COGNITIVE ACTION OF SELF IDENTIFICATION THAT GIVES IDENTITY ITS MEANING. AS A MATTER OF FACT, WE UNDERSTAND IDENTITY THEN, NOT AS A FUNCTION OF A PLACE, AS MANY BELIEVE. IT IS THE STATE OF SELF ASSIMILATION WHEN, IN A CERTAIN SETTING, INTRINSIC EVENTS (PLACES, ORGANISMS, OBJECTS IN NATURE) MOTIVATE ACTIVITIES OF THE COSMOCOGNITIVE SCHEMATA OF AN INDIVIDUAL (a modification of the concept of identity should be considered here). In stressing this, the cognitive activity takes place independently of the individual's own bio/cultural structure or its variant micro-ecological settings. If identity is associated with culture, artefacts, built up areas, or any other man-made object, it should follow that identity is a very recent 'FEATURE'. FIRST, there is no obvious scientific reason to believe so. SECOND, if considered as an act of territorial delimitation, then

those organisms (people, animals, 'extraterrestrial' creatures) who flee their territory should cease to experience identity! Another important point, perhaps, is that concerning the various levels of intensity in which inhabitants of certain territory experience its identity. This paradox is solved only when considering that the notion of identity is related to the activities of individual's cosmocognitive schemata which occur, disregarding the nature of the place.

However, there seems to be a great difficulty in marking out the point in history when man first acted with an influence of completely matured cognitive schemata. It seems inevitable to believe that the most early effective implementation of schemata accompanied the making of the first tools by man. If we pursued this particular matter we might find that the development of many schemata might have gone further in time. It would seem, then, that man was experiencing a knowledge of some kind built in his neural system which was providing him with intrinsic information about the familiar materials and objects which surrounded him. It seems likely that much of what we know about wood, water, dust, earth, fire, light, textures, colours, fog, stone, clay, hay, trees, shade and so on is pertaining to the intrinsic information of that very distant and infinite past.

We do not seem able to conceive of a certain starting point in history for such knowledge to act. There is no doubt that knowledge of new events such as those concerning emerging societies, agricultural techniques, religious rituals and cultural features, has been acquired accumulatively by experience. It might be true, also, that experiential schemata have undergone a series of evolutionary processes during the different stages of human history. I am

assuming, then, that perception of cultural features, human artefacts and even many ecological events of the past implied mental processes which were more or less different from those employed in the perception of today's similar objects. Yet there is no historical evidence that knowledge provided by the non-experiential schemata (knowledge of natural objects and natural systems) involved mental processes different from one developmental period to another. The message that I would like to convey here is that COSMOCOGNITIVE SCHEMATA WERE, AND STILL ARE, THE PROCESS OF SELECTING FOR THE CULTURALLY AND ECOLOGICALLY DIFFERENT PEOPLES OF THE WORLD, THE SAME NON-EXPERIENTIAL INFORMATION ABOUT THEMSELVES AND EQUALLY ABOUT THEIR COSMICAL SURROUNDINGS AS ONE ESSENCE. INDEED, THESE SCHEMATA DIRECT HUMAN PERCEPTION TOWARDS UNIFORM BEHAVIOUR AND PROMPT VARIOUS INDIVIDUALS TO RESPOND TO NATURAL PHENOMENA IN SIMILAR WAYS.

It should be expected that one may question the possibilities of providing evidence supporting the existence of cosmocognitive schemata. In fact, whether in psychology or many other human sciences, it is only tracing and observing the various behaviours of people which provide the basis for many hypotheses or concepts. A good deal of modification of any concept could be achieved by further examination of behaviour. It has been suggested that, from the biological point of view, a schema is a part of the nervous system. It is some active array of physiological structures and processes (U. Neisser 1976). It is important but extremely difficult to understand these structures in biological terms. Hence it is worth noting that schemata exist in their activities and the way they prompt certain behaviours and reactions. As for cosmocognitive schemata it can be assumed that they exist because they condition people to perceive and respond to certain stimuli whether they want to or not, regardless of their set of attitudes at the moment or

their cultural backgrounds. However, their influences on human behaviour and responses are certainly evident in enormous situations and events.

In all these events man either perceives objects in their native state, i.e. its authentic characteristics are exhibited - for example, colour strength, smell, structural qualities and the like, or he perceives a cycle or an ecosystem or part of it that involves a set of objects. It is worth noting that in nature there are as many acting ecosystems as one may imagine. Almost entirely all natural phenomena should have embodied one or more of these ecosystems. They are as old as the universe itself (See ARTICLE 7-5).

It is important to regard the earth, its local environments and its living components as a system. A system is defined as 'a structured set of objects and/or attributes' (Chorley and Kennedy 1971). These consist of components or variables that exhibit discernable relationships with one another, and operate together as a complex whole. It is important also to know that though the two major components of the earth's system are the living material and non-living environment, this distinction involves separating the inseparable. The real world is continuous, and sub-divisions of it merely represent subjective and often artificial portions of reality. The real world can be visualised as a set of inter-locking systems of which man is, at various scales and of varying complexity, forming a nested hierarchy so that they are all to some extent mutually inter-dependent (C.C. Park 1980). Among the very important systems is the energy system. There are three basic sources of energy: gravity, internal forces within the earth, and solar radiation. The latter is the most important source because of its abundance; it can be converted by green plants into energy forms which can be used by plants, animals and man, and it provides the

main source of power for other major systems - in particular the water cycle and atmospheric circulation. Another system is the water cycle. Like energy, moisture can be present in the environment in more than one form but, unlike energy, water follows an essentially cyclic pathway through the environment. The water cycle is important because it ensures ecological diversity and stability; it affects the sediment and chemical cycles through landscape stability and erosion, and it affects the energy system because water is the basic limiting factor without which plants and animals would not exist. There are the chemical elements cycles, the sediment and many other systems whose implication on architecture will be studied later. IT IS WORTH NOTING THAT NATURE HAS SPENT LITERALLY MILLIONS OF YEARS REFINING A STABLE ECOSYSTEM, AND THIS IS EVIDENCED IN THE COMPLEXITY AND STABILITY OF THE BIOSPHERE OF WHICH MAN IS A PART. It is quite clear that life on this planet depends on a delicate ecological balance among its many systems at all levels of complexity. Each organism contributes to and takes from its natural surroundings in such a way that an overall equilibrium is maintained. It seems likely that, by its very nature, an organism's neural system can indicate this state of equilibrium. It is interesting to speculate about possible structural relationships between the state of equilibrium and the feeling of security that overwhelm an organism when perceiving an element associated with the natural ecosystems such as water, smoke, earth, light, green or blue colour, and the like. It might be useful to recall the ambiguous instances when we are hit by sudden feelings of security for which we cannot find an obvious reason. What is involved in these events is a kind of highly sophisticated cognitive response that takes place immediately involving no 'traditional' mental processes like those

of imagining, remembering, problem solving and so on. The aim of these words is that the major characteristics and functioning of cosmocognitive schemata are best understood as security indications. They may also prematurely warn the organism when an unperceived disruption to a basic natural system is in the process. A probable explanation for this is that the cosmocognitive schemata, being constructed by natural elements, function in the organism so as to represent the behaviour of these elements as if they were in an ecosystem. It is, obviously, difficult in the present time to offer an explanation for the mechanism in which an element's behaviour affects the nervous system or implied in the cognitive activity of the schemata. What is most significant in the context of this study is that such implications do exist and they are the essential determinants of architectural and environmental activities. From what has been said so far we come to reconsider those objects and events in our physical surroundings towards which we find ourselves profoundly inclined and yet we totally ignore them when it comes to design. There are often quite pressing difficulties in understanding what is behind our luxurious feeling when perceiving a charcoal fire, for example, as opposed to the electric fire we use at home. Also ambiguous is that aesthetical impact on perception of a wall which exhibits the native qualities of brick or stone or has been 'enhanced' by the colour of some climbing plant (FIGURE 7). It is almost entirely true that all kinds of people would cognitively respond to the earthy smell which follows rain in quite a similar way. It might be generally agreed that people feel as if they were hit by instant and mysterious 'coma' when they, for some reason, smell an old clay brick or a mud mortar or when they, approaching the sea, inhale its fishy smell! The fact that people are willing to pay much more for a small cottage in the town outskirts would not be taken

to imply that a cottage provides better accommodation or offers more services than does a house in a modern development. This should not be taken to mean that people always know what they are doing or why they are doing it. They are very often unaware of the real reasons for their actions. But people's inability to give a good account of their own behaviour does not mean that they are automatically controlled by simple stimuli. As we have seen, the case is simply far more than that. And yet, of course, there are many similar effects. One of these is, no doubt, the intriguing experience of riding a horse. I can assume that it, certainly, induces a luxury 'existential' feeling which an expensive vehicle is far beyond providing. A second example is that of a person moving from one light zone to another, say from the sun to a shaded area. He will probably experience a kind of perception that would be equally familiar to all people. The available evidence does not allow a convincing explanation for the feeling of sudden knowledge and comfort induced by the sight of the colour green (of a plant) or blue (of the sky). The same argument applies to scenes that comprise water, whether in rivers, seas or ponds. Even more impressive is the instance of lost persons in a deserted place when the sensation of a breeze, the smell of an animal or the odour of a tree induces in them a feeling of sudden knowledge of the place as if they experienced it before! My argument here is that a sort of communication of cosmological nature takes place immediately between such a person and any natural object they encounter. To some degree the same theme is applied when in a modern town of extreme metal, glass and concrete buildings one's feeling of their stiffness and hardness is softened by the sight of a hedge or a small stone house. There is only a slight exaggeration in saying that a perception of mud,

dust or smoke from burning wood is accompanied for many people by a sensation of security and a feeling of belonging. I was once touring one of the French New Towns near Paris, famous for its 'eccentric' buildings. I was overwhelmed by a bitter feeling of strangeness and loss when I accidentally hit a dust bin and a cat ran quickly across my path, bringing me back to myself. Both the spilt rubbish and the cat made me extremely happy by reminding me that I was still on this planet! The same relief can be felt when in a modern city a fountain or a landscape of rough pavement or a brick pattern comes into view. There are only a few people who can understand what makes so inviting a restaurant with rustic or old wood furniture, black cooking pots, a deer head hung on the wall, or wooden dining utensils (spoons, salad dishes, etc.).

It is evidently easy to add to these examples another set of perceptions where a utilisation of natural phenomena or ecosystem is predominant. The evidence points clearly to the influence of cosmocognitive knowledge in determining perceptual dominance in scenes involving, for example, windmills, sailboats, water-wheels, air catchers, etc.

There are a number of currently very controversial issues regarding the concept of time. Nonetheless, it is hard to imagine what is behind the feeling of security which is often associated with anything old. A useful utilisation of the concept of cosmocognitive schemata is that it presents a plausible explanation to this vital matter. It seems that cosmocognitive schemata are the schemata responsible for perception of the 'universal time'. Although not a tangible part of any ecosystem, time is a fundamental variable in everything that happens within the ecosystem. There are several different perspectives of time, all of which grade into one another.

Very short time is the scale on which 'instantaneous' changes occur, while historical time refers roughly to the span of time for which written records are necessary; it is a means of recording cultural, political, social and other environmental phenomena that extended over too long a time for memory alone. And then there is universal time. It seems that by their very nature, cosmocognitive schemata are the schemata responsible for the perception of universal time. It refers to long-term changes and evolutions within the universe of which the ecosystems are part. Ecological changes through time occur on a wide range of time scales from the level of seconds to the very nature of human body organisation of which schemata are a most significant part. That is, the natural ecosystems are balanced systems with an astounding array of homeostatic mechanisms which allow various parts of the ecosystem to respond and adapt to the normal changes that take place in other parts over time. The cosmocognitive schemata represent this natural balance. The present day is a period of rapid change, much of it the result of human intervention in the environment. Through man's use and misuse of chemicals, and through his production of simplified and artificial systems, many changes that normally take place over a long time have been compressed into a short time. As a result of the increase in the rate of change beyond that to which the ecosystem can respond, man upsets the natural balance and turns a stable system into an unstable one. It is all reflected in the schemata which warn man of such threatening disturbances. Thus age is associated with security to the degree that the schemata indicates that long time over which the balanced and secured ecosystems were achieved.

Among the very important characteristics of the cosmocognitive schemata are those which provide the basis for perception principles of the Gestalt school of psychology. It is interesting here

to cite Eysenck's statement that "Gestalt laws of perceptual organisation make reasonable intuitive sense, but they are obviously descriptive statements possessing little or no explanatory power." It is hoped that the concept of cosmocognitive schemata which I present in this study may provide this explanatory ground for the Gestalt laws of perception.

It is well known that the Gestaltists call those areas of a visual display that are encoded as figures or organised "WHOLE". They considered that psychological organisation will always be as 'good' as the prevailing conditions allow. In practice they regarded a good form as the simplest or the most uniform of the available alternatives. In that they believed that we tend not to see just parts of objects or figures, even when the visual stimulation we have is only partial. The mind (or some specific part of it!) fills in the missing parts.

I have found a striking conformity between the characteristics I introduced as cosmocognitive schemata and the circumstances which apply to the perceptual organisation of the Gestalt psychology. In that one can attribute the perceptual dominance in my examples of the wooden tools, windmills, native qualities of building materials, and so on to a high degree of internal redundancy possessed by these objects. The quality of redundancy was referred to by Attneave in 1954 when he made a noteworthy attempt to render the Gestalt notion of good form. He argued that a 'good' figure is one with a high degree of internal redundancy; in other words, the structure of any unseen part of a 'good' figure is highly predictable from the parts that can be seen. From this perspective, factors controlling the perception of objects and ecosystem components in my examples, which people fully perceive with simple mental processes, all reduce perceptual uncertainty by providing redundant

information. In that it was suggested that the visual stimulus which is most likely to be perceived first, is that which requires the least amount of information to describe it (dust, mud, water, stone, etc.) (see Hochberg 1978).

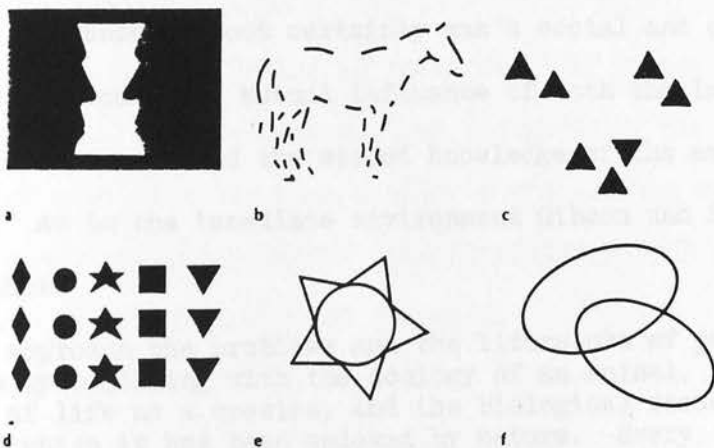
The Gestalt psychologists have elaborated on many perceptual laws (see the Figure) but it will be remembered that the major perceptual law introduced by them was the law of good form (M.W. Eysenck 1984). They put forward the concept of the overall whole as the major unit of analysis within perception, and perhaps their best known view is that "the whole is more than the sum of its parts". That is, "the way in which parts are seen ... is not an arbitrary piecemeal but is a process in which characteristics of the whole play a major determining role" (Wertheimer 1958).

One of the implications of the Gestaltist approach which I find most relevant to the condition within which a perception of objects or events belong to the natural phenomena and universal ecosystems is that which suggests that the 'whole' may be perceived before the parts comprising that whole. This idea was put to test in an important series of experiments carried out by Navon (Navon 1977). He drew a conceptual distinction between global (cosmic in my notion) and local features; local features are more specific than global features and are consequently 'part-like', whereas global features are more 'whole-like'.

FURTHER DISCUSSION

There exist particular perceptions of objects and events which imply universal effects on different people and which are found to be more associated with the whole of cosmic features. These perceptions occur with striking immediacy and require minimum

information which is not necessarily stored in the brain or acquired by experience. Rather, it is an antecedent knowledge innately equipped in a part of the neural system, in what I called the 'cosmocognitive schemata'. The rapidity with which these schemata make their shadowing responses to the primary message coming from these objects can only be understood in terms of the elementary relation of the organisms to the universe as a whole, comprising a set of ecosystems and natural elements and their components. It is worth noting that MAN'S EXTENSION IN TIME IS MARKED BY THE VIVID USE OF THE COSMOCOGNITIVE KNOWLEDGE IN HIS ADAPTATION TO NATURE AND THE PHYSICAL SURROUNDINGS. HE PERSISTANTLY WAS AND IS YET UTILISING THIS INNATE KNOWLEDGE, BLENDED WITH ACTIVITIES OF OTHER EXPERIENTIAL SCHEMATA (MOSTLY ECOLOGICAL AND CULTURAL) IN THE ELABORATION OF THE VARIOUS ARCHITECTURAL FORMS AND PATTERNS. IT IS EXTREMELY IMPORTANT TO ESTABLISH A THEORY OF ENVIRONMENTAL QUALITY WHICH CONSIDERS COGNITIVE SCHEMATA AS OUR ONLY RESOURCE ON WHICH ASSESSMENTS OF THE ENVIRONMENTAL QUALITY ARE PRIMARILY BASED.



Gestalt principles of perception. (a) Figure-ground: what is perceived is a function of what is considered background and what is considered figure. This object is either a vase or two faces. Although we can alternate from one to the other, we cannot perceive both at once. (b) Closure: incomplete patterns are perceived as complete. (c) Proximity: objects that are close together tend to be perceived as being related. The eye sees the triangles as three distinct groupings. (d) Similarity: similar objects tend to be perceived as related. This array is perceived as vertical columns rather than as horizontal rows. (e) Continuity: perceptual phenomena tend to be perceived as continuous. This figure is perceived as a circle within a five-pointed star, not as five quasi-triangular figures. (f) Prägnanz: perception tends to result in "good forms." This law governs all other laws of perception, since complete, proximal, similar, and continuous objects are better forms than those that are incomplete, nonproximal, dissimilar, or incomplete. This figure is perceived as two overlapping circles, not as three irregular-shaped objects.

6.6.2 Two: Experiential Eco/Cultural Schemata

Since man's existence on earth, his greatest achievement has been the elaboration of his habitat in which he established himself as a 'cultural animal'. Expressing this was through the lawful utilisation of the interrelationships among various ecological elements, systems and their components. Water cycles, thermal capacities, energy systems, land forms, soil properties, natural elements and local materials, local sources of economical possibilities, conceived nature and so on, have collectively credited man with a creative knowledge of how to unselfconsciously adjust his activities to fit his physical surroundings and to predict future possibilities. It is thus of some theoretical significance to investigate the role that experiential knowledge plays in underlying man's preferences, responses and his elaboration of the environmental quality. There is much evidence that building form, organisation of house type and settlement morphology have acquired their characteristics basically as an outcome of a series of experiential cognitive processes. Most certainly man's social and cultural behaviour responds to a mutual influence of both the immediate physical environment and the stored knowledge of the experiential schemata. As to the immediate environment Gibson and Spelk (1983) suggest that

"We approach the problems and the literature of perception by beginning with the ecology of an animal, its way of life as a species, and the biological structures with which it has been endowed by nature. Every species has evolved in a habitat, and in the long course of evolution, its niche and its biological structures have developed in reciprocity with one another. The perceptual systems developed in the context of this mutual relationship. They have adapted to enable the perceiver to extract the information that he needs for survival in the kind of world he lives in, especially to extract information about the affordances of things." (Gibson & Spelk 1983)

Gibson suggested that species have developed very complex, high-order perceptual skills which serve their adaptation to their habitat. It was found that some important perceptual skills might only be acquired later in ontogenesis, through experience. Piaget viewed human cognition as a specific form of biological adaptation of a complex organism to a complex environment. It is an extremely active system which actively selects and interprets environmental information in the construction of its own knowledge, rather than passively copying the information just as it is presented to the senses (J. Flavell 1985). While paying attention to and taking account of the structure of the environment during knowledge seeking, the mind always reconstructs and reinterprets that environment to make it fit in with its own existing mental framework. In architectural language, what the designer does is reinterpret the environment to make it fit in, through his designs, with his own knowledge structure which he built through past experience of the environment itself.

What happens in Piaget's view is that the mind builds its knowledge structure by taking external data (by experience) and interpreting it, transforming it, and reorganising it. It therefore does indeed meet with the environment in the process of constructing its knowledge, and CONSEQUENTLY THAT KNOWLEDGE IS, TO A DEGREE, "REALISTIC" OR ADAPTIVE FOR THE ORGANISM.

Piaget's contribution to the study of cognitive development is immensely important both quantitatively and qualitatively. Hence it is worth investigating his approach within environmental design, especially for the acknowledged importance and influential role it plays in this area. Piaget and his colleagues have put forward the most thorough account ever offered of the ways in which people's thinking develops (J. Flavell 1971). Such is the richness of his

theoretical contribution that it ought to be widely considered by design theorists for its useful application in architectural design. Piaget considers that cognition, like other forms of biological adaptation, always exhibits two simultaneous and complementary aspects, which Piaget called assimilations and accommodation; two sides of the same cognitive coin. Assimilation essentially means interpreting or construing external objects and events in terms of one's own presently available and favoured ways of thinking about things. The young child who pretends that a chip of wood is a boat is, in Piaget's terms, assimilating the wood chip to his mental concept of boats; incorporating the object within the whole structure of his knowledge of boats (J. Flavell 1985). Accommodation roughly means noticing and taking cognitive account of the various real properties and relationships among properties that external objects and events possess; it means the mental apprehension of the structural attributes of environmental data. Assimilation, therefore, refers to the process of adapting external stimuli to one's own internal mental structures, whereas accommodation refers to the converse or complementary process of adapting these mental structures to the structure of these same stimuli. A 'traditional' builder, architecturally speaking, during his years of growth and through experience adapts the environmental properties to his own internal mental structures; in other words, schemata. He then, through the act of building, adapts these mental structures (schemata) to fit in with the properties of the same environment.

In Piaget's view, therefore, in any cognitive encounter with the environment, assimilation and accommodation are of equal importance and must always occur together in a mutually dependent way. Piaget's model of the human cognitive system stresses the constant interaction or collaboration of the internal-cognitive with the

external-environmental in the construction and deployment of knowledge, with both factors making a vital contribution to the construction and deployment. What you know already will greatly shape and constrain what environmental information you can detect and process, just as what you can detect and process will provide essential grist for the activation of present knowledge and the generation of new knowledge.

Piaget's assimilation-accommodation model provides a valuable general conception of how people's cognitive schemata might interact with their external environments. The point, however, is that it is equally well set up to describe how a mind might gradually develop and change its structure and content through repeated experience of the milieu, and is therefore a particularly useful model to communicate on cognitive structure.

Thus in the course of trying to accommodate to some unknown functional properties of the various available materials, and of trying to assimilate the materials and their properties to existing concepts and skills (trying to interpret them and make sense out of them) a man's (or a builder's) mind stretches just a little, and thus stretching in turn broadens slightly his future assimilatory and accommodatory possibilities. By repeated assimilation of and accommodation to a given milieu, the experiential cognitive schemata evolve slightly, which makes possible somewhat novel and different assimilations and accommodations, with these latter changes producing further small increments of schemata growth. Thus, the dialectical process of development continues in this gradual fashion and it is clear why such development would be slow and gradual.

It would not be surprising to assert that the same processes have worked out man's discovery of the various functional properties and physical performances of the many materials he used in his

buildings. He was gradually incorporating into his cognitive schemata a knowledge of how to manipulate these properties in producing building forms and elements whose shapes and patterns, he found by experience, exert an ultimate structural and thermal performance. Man, by virtue of his cosmocognitive knowledge and by the accumulation of experiential knowledge, has learned, for example, that an arch can bridge an opening in a brick or stone wall without the need to use an auxiliary element of other material. He also learned how to adjust walls to achieve both structural support to the roofs as well as optimal thermal comfort, before learning how to employ them for his social purposes. It is indisputable that invention of appropriate shapes and types of various architectural elements occurred following a long and gradual process in which function and fitness with the prevailing environmental conditions were the primary objective before satisfying man's aesthetical and cultural endowment. It would not seem perhaps too uncertain that architectural aesthetic endowment itself was accumulately embedded in man's cognitive structure following a prolonged experience of the functional attributes of building materials and elements. Thus for a very long time man has responded to buildings with an aesthetic capacity basically and cognitively built out of the natural and functional properties of their materials and elements. In many respects, environmental preferences are cognitively determined. In other words, responses to colours, textures, articulations, juxtapositions, patterns of movement, spatial structures, etc. occur only as much as schemata store knowledge about them.

It has been demonstrated in this chapter that schemata store a knowledge of single substances; their behaviours and properties. They also store a knowledge of events and instances of a larger scale, which may involve one or more systems (e.g. ecosystem, organism

community, etc.). Generally substances, including building materials, possess native (authentic) properties such as colour, texture, smell, strength, density, moment of inertia, elasticity, plasticity, thermal capacity, absorptivity, reflectivity, shearing capacity and so on. Unlike substances, events or systems may have, besides, rather more sophisticated properties which usually occur within more complex structures, patterns, forms, articulations, flow and at different scales. Man, by virtue of his very nature, by adaptation and by experience, has been aware of and virtually committed to these constellation of properties and their various implications in building activity and also on his socio/cultural life. Thus information already acquired, embedded and structured in man's neural system, will determine his expectations and conceptions of the environmental quality, and his future choices. It will inevitably continue to play a substantial role in establishing environmental meaning and embody its symbolic representation. Neisser stated that (1976) "Because schemata are anticipations they are the medium by which the past affects the future".

Most importantly, experiential information provides a mental basis essential for the continuity of activities and behaviours which have already been tested as most compatible and most fitting to their ecological setting. In other words, the process of establishing the social and cultural contexts of a society involves a utilisation of all information provided instantly by experiential schemata. They are information about essential natural substances and systems which the various activities of that society depend upon. Quite often successful determinations about types of activities and patterns of exploitations are inherited from one generation to another rather than made by an act of thoughtful calculations.

Similarly, most convincing architectural solutions - their aesthetic qualities and environmental implications - are, in principle, a result of choices which basically involve cognitive activities rather than a result of 'artificial' or cognitively interrupted and conceptualised design efforts. Hence, considering schemata as the symbolic representation of information gathered through the experience of a place and including physical, social and cultural clues, it follows that man structures his values in accordance with his schemata (Rapoport 1977). Rapoport suggested that new information is related to old through the way it fits into schemata and this stimulates the organism to act in some way accordingly. In other words, behaviour depends on the schemata on what one believes to be true. Schemata are known to be resistant to change and clues which are at odds with them are rejected. This inevitably explains the reason why so often people are reluctant to accept the design solutions presented by the modern movement in spite of its claimed 'scientificity' and broad variety of thoughts and 'fascinating' techniques. Evidently these solutions, in their entire characteristics, were put to meet intellectual purposes often subject to death and mostly of temporary validity. They do not correspond to people's cognitive structure represented by both the innate and the experiential schemata - insofar as these schemata change very slowly (except for the innate schemata which may never change) and yet maintain a strong structural relation to natural ecology, designers should seek to meet cognitive requirements rather than some vague theoretical aims. It is thus my belief that only by exploring into people's cognitive style that a design becomes appreciated, fit, and more successful to those people. Limitations of design methods and planning restrictions based on abstractions, sophisticated theorisation, exotic ideologies and so on should give up to a broad freedom of ecology and its cognition.

Because it is only by meeting people's cognition that a judgement on the quality of any artefact can be feasible and scientific.

6.7 TOWARDS A NEW THEORY OF ENVIRONMENTAL QUALITY BASED ON COGNITIVE SCHEMATA

Both designers and the general public talk of 'good environments' or successful designs, etc., but have, in fact, totally different attitudes towards what is environmental quality. People's responses to architectural works imply mechanism that is lacking in the designer's attitude to his work itself. While there is a consensus of people's perceptual responses (Ittelson 1973), designers differ from one another in the principles which they usually claim to underly their differing designs. What often happens is that the designer makes his assessment with reference to a set of themes, mostly abstract and irrelevant to the building's ecological and cultural context. People hardly make assessments, they just perceive with striking immediacy, and their responses become spontaneous. It is true, of course, that people have thoughts, images and feelings, but while an act of creation should require a thought, perceiving is not necessarily of this nature. Michael Eysenck stated that perception of environment is a relatively effortless process for most of us. "Perception does not require remembering in the ordinary sense, but it is an activity in which both the immediate past and the remote past are brought to bear upon the present" (U. Neisser 1976). The apparent simplicity of perception makes it difficult to realise that perception is, in fact, rather complex. Both cognition and perception are best understood as applications of the same fundamental cognitive structures. But many contemporary theories consider that all mental, cognitive and perceptual activities depend upon pre-existing structures called schemata (U. Neisser 1976).

There is quite a convincing reason for this study to adopt an approach to environmental quality and design nature through the understanding of the cognitive schemata, their processes and functions, upon which people's responses, evaluations and preferences of the environmental quality are based. A MAJOR CHARACTERISTIC OF A SCHEMA IS THAT IT CONTAINS, AS PART OF ITS SPECIFICATION, THE NETWORK OF INTERRELATIONS THAT IS BELIEVED TO NORMALLY HOLD AMONG THE CONSTITUENTS OF THE OBJECTS, EVENTS OR SITUATIONS. INDEED, THERE ARE SCHEMATA REPRESENTING OUR KNOWLEDGE ABOUT ALL CONCEPTS: THOSE UNDERLYING OBJECTS, SITUATIONS, EVENTS, SEQUENCE OF EVENTS, ACTIONS AND SEQUENCE OF ACTIONS (Rumelhart 1980; Article 5-9). In stressing this, though not denying designers' own individual resources of knowledge, designs with qualities that are characteristic of people's cognitive style and cognitive structure are unmistakable.

6.8 IMPLICATION IN ARCHITECTURE

We have previously talked of the differentiatonal role of ecology in producing distinctive cultures and consequently different architectural forms and practices. Now we have already seen that this is only possible because of the nature and function of the experiential schemata to pick up and store information characteristic to a specific setting. We have also suggested that another set of schemata are nonexperiential and that they store knowledge of universal effectiveness. So what are the implications of this theoretical notion for the issue of architectural design? On the one hand we have so far implicitly assumed that there is a fairly direct relationship between cognitive schemata and the processes of the architectural experience. On the other hand there is an important distinction to be drawn between the experiential and nonexperiential schemata. The first set are differentiatonal, i.e.

the typical result from their effectiveness is the production of diversity on the various scales (e.g. in materials, forms, patterns, elements, spatial structure, etc.) characteristic of the prevailing environmental circumstances. Contrary to this the unifying effectiveness of the second type is obvious in the perception of unity within a certain milieu of diversified elements, materials, facades, appearance, etc. Furthermore, we are fairly likely to perceive this unity even among several milieus of entirely different forms or materials. The explanation of this, of course, is that people experience familiar knowledge of the authentic properties of these materials and the way they act in the building even when these materials are not often familiar in people's setting.

It seems very clear that what we are aiming at is that building materials, the various architectural elements (arches, roofs, columns, walls, etc.) as well as the various land uses and activities maintain certain images and have, indeed, certain cognitive representation specific for each group of people. Therefore there will be good grounds for regarding that the designer's task is not to express ideas or induce feelings, but actually to search for the cognitive values and images and consider them as the essential criteria to meet people's specific ecological and cultural needs.



FIGURE 7 The architecture of a building is enhanced by the green colour of a climbing plant.

THE ECOLOGICAL FACTORS

The Constructive Elements of
Schematic Knowledge

THE ECOLOGICAL FACTORS

7.1 INTRODUCTION

The aim of this and the following chapter is to introduce in a rather detailed way some general ecological factors that are thought to be most essential for the abundance of any group of people and most characteristically effective for the flourishing of their specific culture. The word general is used here to refer to the point that there are other factors which are more specific, and hence ought to be studied within their own context. The aim is also to briefly examine the role of these factors in the elaboration of built forms, the setting of settlement morphology and structure, the choices of materials and generally in the determination of local architectural practices and their aesthetic dimensions. While studying these factors, attention will be focused on their implication in structuring people's cognitive schemata. Clearly through the course of the previous psychological studies, people do not react to the environment directly or immediately. Rather, they have their own interpretation of the various elements through a knowledge that is deeply embedded in their innate and experiential schemata. Hence beside the usefulness of studying the direct influence of these factors on building forms (a knowledge probably lacking among many young architects concerning their geographical settings), the study will enable these architects to trace the relation between ecology and the derivation of cultural and aesthetical capacities of built environment. Finally, it could be stated that a major cause of this study is the harmful

consequence of an interest in abstractional and theorisational attitudes which present architectural practices have recently induced to various ecologies or local cultures.

7.2 COSMIC INFLUENCES

The evolutionary development of all living organisms, including man, took place under the influence of cosmic forces that have not changed for very long periods of time. As a result, most physiological processes are still geared to these forces. They exhibit cycles that have daily, seasonal and other periodicities clearly linked to the periodicities of the cosmos (Dubos, 1965). The major biological periodicities, Dubos stated, derive from the daily rotation of the earth on its axis, its annual rotation around the sun and the monthly rotation of the moon around the earth.

While daily, lunar, seasonal and their periodicity are a universal feature of biological phenomena, their precise mechanisms are still a matter of controversy. Dubos' assumption is that each organism possesses a number of 'internal clocks' which, like alarm clocks, indicate when a given biological activity should begin. Biological clocks, whatever their nature, would thus be the anatomical and physiological mechanisms of evolutionary adaptations to the periodicities of the physical world. On the other hand this concept is not universally accepted. The organism's time sense is simply a reflection of changes in the environment. Even under constant conditions, living organisms are reacting to a great number of fluctuating factors of the environment such as the cosmic rays, background radiation, and the earth's magnetic and gravitational fields. These forces can act as determinants of biological rhythms. All biological rhythms, the daily, seasonal and the lunar periodicities occur even in very simple forms of life. It has been stated (Dubos, 1965) that although the essential characteristics of internal environment in animals and man must remain within certain limits to be compatible, the maintenance

of life, nevertheless, some of the most important biochemical activities of their tissues exhibit marked seasonal variations. The blood pressure of man in temperate countries exhibits a peak in spring and a trough in the late summer. Deep body temperature also seems to exhibit seasonal fluctuations. Moreover, both animals and men maintained in a controlled and stable environment exhibit rhythmic variations in their response to stresses, crowding, physical activity, availability of certain types of food, which, no doubt, are profoundly conditioned by the physical environment and play a role in disease (Dubos, 1965). In addition to this is the fact that internal environment of man varies with the season. These seasonal changes affect resistance to various forms of stress. It seems worth stating some aspects of biological cycles concerned with the effects of light. Light plays a role in the hormonal activities of the human kind just as it does in plants and animals. For example, Eskimo women are said neither to menstruate nor to conceive during the long polar night and similar statements have been made concerning Patagonian women of the Antarctica. Until the last century, man lived in the dark for long hours during the winter months, and this is still true in many primitive societies. Modern man, in contrast, is exposed to bright light for 16 hours a day throughout the year. In view of the fact that light rays can affect several hormonal activities, many, if not most, physiological functions, and that are linked to daily and seasonal cycles, it seems possible that this change in the way of life will have long-range consequences for the human species.

The length of time required for adjustment of a given physiological function to a new environment naturally varies from person to person, but the disassociation of one rhythm from the other is the most striking feature of the change. However, on one hand biological

rhythms are the expression of some physiological characteristics inherent in man, while on the other hand they can be altered by modifying the environment. The interplay between the intrinsic biological nature of man and the environmental forces that impinge on him focuses attention on physiological problems which may have pathological implications. MODERN MAN IS LIVING UNDER CONDITIONS THAT DIFFER MORE AND MORE FROM THOSE UNDER WHICH HE EVOLVED. He heats and cools his dwellings in an attempt to obliterate as completely as possible the environmental changes associated with the seasons; he carries his day into the night or vice versa, he moves by jet aircraft in a few hours from one latitude or longitude to another. These technological innovations certainly, Dubos states, have profound effects on human physiology, as have many modern buildings, and it would not be surprising if some of their effects played a part in the disease characteristics of modern life.

The discussion of the relation between disturbances of biological rhythms and human integrity is highly speculative, especially in architecture. But man responds not only to heat, humidity, light, and other obvious climatic components that are readily perceived by the senses, but also to many other environmental factors not readily identified, and in part still unknown by many architects of today.

7.3 MAN'S NATURE AND MAN'S BIOLOGY

It has been suggested that man's behaviour is governed by forces which have their origin in his social and cultural past. Many of the biologists disregard historical considerations when they attempt a scientific study of man. Many of them emphasise those aspects of man's nature which can be described as physio-chemical systems and which unfold according to the information inscribed in the genetic code. Others attempt to trace the origins of human species in the hope that knowledge of its evolutionary past will help in understanding its present condition. Still others are more interested in the physiological and psychological characteristics of each individual person, as conditioned by the environment. Different as they appear to be, all these aspects of the study of man are interrelated. To study the physical and mental state of man, one finds it useful to differentiate between conscious and unconscious responses. In reality, man is an integrated entity and all these forces operate simultaneously in every event of his life. The body and the mind are the living records of countless influences which have shaped each individual person from the most distant past to the present instant. Man is indeed the product of his history, but this history is far more complex than one would imagine. Knowledge of ancient man is derived as much from the evidence which has survived of his intellectual activities as from the remains of his physical body. The finding of tools in geological deposits, and of offerings buried with the dead, is the final criterion on which to decide that the creature who occupied the site was a man and not a beast (Dubos, 1965).

In many Paleolithic sites, figurines found of naked women represent a woman with exuberant fleshiness. The sexual and maternal aspects are grossly exaggerated: the breasts are large, the hips broad, the buttocks rotund. Consciously or unconsciously the Paleolithic artist elected to emphasise the anatomical parts relating to femininity and barely suggested other parts, such as the hands and the feet, not related to the sense of female fulfillment. Such a figurine obviously does not represent an actual woman, but is a symbol. It constitutes an interpretation of womanhood. It is precisely in this way that ancient and modern man worked their built environment as their interpretation of the symbolic significance of native elements and materials constituted the objects of their habitat.

Today, as in the ancient past, the mark of man is the intense, complex and so far unexplained interplay between his body and the symbolic activities of his mind. Because of this interdependence, anything that impinges upon him affects simultaneously both body and mind and causes them to interact. Thus to study the body and to neglect the symbolic activities is to ignore the most characteristic aspect of man's nature (Rappoport, 1977).

When discussing prehistoric periods, we emphasise man's struggle with the effective forces of his environment, and the problems which arose from the desire to achieve secure living conditions out of meager resources. Nonmaterial factors influenced his life as much as did the brute natural forces; the environment acted on him indirectly as much as directly. Mechanical stresses, irritating materials, radiations, and temperature act directly on the human, but in addition to their direct effects on the body, environmental forces also have indirect effects on him. The mind plays a dominant role in conditioning those effects, both quantitatively and qualitatively.

This chain of indirect responses is of great importance to man because of this propensity to symbolise everything that happens to him, and then to react to the symbols as if they were actual environmental stimuli (cognition). As a consequence of this trait, the response of a human being to any environmental factor is highly personal because it reflects all his own past experiences. The personal past is such a powerful force that it can distort and even metamorphise the most trivial as well as the most sublime experiences and thus convert them into ordinary reactions.

The biological memory of the past is not the only factor that distorts the direct effects of environmental forces. Man's response to any stimulus is also affected by anticipation of the future, whether these be conscious or subconscious. Indeed anticipation of the future is the aspect of his nature which most clearly differentiates him from animals. The more human he is, the more intensely does his anticipation of the future affect the character of his response to forces of the present.

Thus, all the perceptions and interpretations of the mind become translated into organic processes. The body machine reacts not only to the stimulus itself but also to all the symbols associated with the experiences of the past and the expectations of the future, symbols which are converted into effective stimuli by a particular event.

7.3.1 Man as Social Animal

Another major characteristic feature within human nature is the description of man as being a social animal. Man, in fact, continues to require the support and encouragement of other men throughout his life. When *homo sapiens* first becomes identifiable

on the archeological scene, he is already found in fairly large social groups. However, the very process of civilisation makes him even more a tribal creature. Throughout the living world, the association between different organisms brings out characteristics, properties, and problems which are different from those exhibited by an individual member of the group living alone. The emergence of new structures and new activities is most striking, of course, when organisms belonging to two different species form symbiotic partnership. But biological innovations occur also whenever several members associate to form a population. The individuals within a group interact in a variety of ways, and this interplay brings about the unfolding of potentialities that would remain unexpressed in the isolated state. The interplay between individuals always changes the expression of their physiological capacity, and of course, their behaviour. The sense of belonging and of togetherness engenders a feeling of security which usually increases the chance for biological success and also for happiness. On the other hand, effects become too harmful if the group becomes too large, especially if it grows too rapidly. There are forms of behaviour, of performance, as well as of disease, which are determined by the size and structure of the group at least as much as they are by the characteristic of its individual components.

In human societies, ethical considerations create attitudes and types of behaviour that appear to be totally independent of biological needs and often conflict with biological urges. For many reasons, therefore, the social group is qualitatively different from the sum of its parts.

7.3.2 Man Genetics

Environmental control is at present of much greater importance than genetic control, but this does not mean that human genetics endowment is immutable. Although it is true that biological characteristics of man have not changed much since the paleolithic times, the genes that govern his constitution, however, provide the opportunity for many important genetic shifts. Man's genetic make-up is certainly still changing in detail, as environmental conditions favour the selection of one aspect or the other of his polymorphic nature. "The environment plays the role of a programming device and natural selection that of a regulatory mechanism". (Dobzhansky, 1963).

In other words, it can be said that environment presents challenges which give to the human beings the opportunity to respond adaptively by altering its genetic composition. The selection of the genes that control the physiologic characters as well as mental traits, has been influenced by the climate, the topography of the land, the kind of food most readily available and other factors of the environment.

7.3.3 Man as Cultural Animal

Modern civilisation increasingly provides a variety of niches for every kind of physical and mental type. However there is no evidence that operation of natural selection has been suspended. It continues to operate in the new zone of adaptation into which man has moved, namely the new environment he is creating. Increasingly, man becomes adjusted to his environment through the social and technological methods characteristic of his culture; these constitute adaptive mechanisms not available to the rest of

the living world. Culture signifies what people do as a result of having been so taught. Adaptation by culture is vastly more rapid, and more effective, than genetic adaptation (Sahlins & Service, 1960). Culture being a product of life so peculiar to mankind is so important in the changes that occur in man and in his society. But cultural forces are not the only factors that can produce profound and rapid alterations in man's nature. Almost every aspect of the environment can alter his body and his intellectual capacities even more rapidly and profoundly than do cultural influences.

7.3.4 Man's Response to Crowding, Territoriality and Human Space

In this context, a reference may be made to further manifestation of human nature which concerns his responses to population density and crowding and also his territorial trends and personal space. There is some truth in the belief that crowding generates environmental problems and adversely affects behaviour and also contributes to various kinds of diseases. "Congested cities call to mind unhealthy complexions and harassed behaviour; city crowds are accused of accepting despotic power and of blindly engaging in acts of violence" (Dubos, 1965). In contrast, rural areas and small towns are thought to foster health, physically and mentally, and strengthen freedom. A quantitative statement of population density is not sufficient to forecast the effects of crowding on human beings. Even more important is the manner in which each particular person responds to other members of the group under a given set of conditions. The response, however, is determined to a large degree by the history of the group and of its individual

members; it may be favourable or unfavourable, depending upon certain circumstances.

In most species, including man, each group develops a complex social organisation based on territoriality and on a social hierarchy comprising subordinate and dominant members. The phenomenon of dominance or hierarchy has a social meaning which transcends the advantages that it gives to the prominent individuals. Acceptance of the hierarchical order, however, reduces fighting and other forms of social tensions and thus provides a stability that is beneficial to the group as a whole.

Although man is a gregarious animal, sudden increases in population density can be dangerous. The biological disturbances created during the industrial revolution can have less effect on the modern man because of his readiness to adapt urban life in the present time. "Under normal circumstances, the dangerous consequences of crowding are modified by a multiplicity of biological, social and cultural adaptation" (Dubos, 1965). Little is known concerning the density of population or the intensity of stimulation that is optimum in the long run for the body and the mind of man. Crowding is a relative term and the biological significance of density may be evaluated in light of the past experience of the group especially determined by various socio-economic and environmental conditions.

Laying claim to a territory and maintaining a certain distance from one's fellow are probably as real biological needs in man as they are in animals (Dubos, 1965), but their expressions are culturally conditioned. The proper distance between persons in a group varies from culture to culture. Although scientists have not yet adequately explained the origin of these differences, they have provided evidence that ignorance of them in human relations

or in the design of dwellings and buildings can have serious social and pathological consequences.

7.3.5 Bioclimatology

Acclimatisation, acclimation, adaptation, and habituation are terms commonly used to denote kinds of adjustments that man makes to changes of climate (Dubos, 1965). The physiological responses that man makes to climatic stresses strongly suggest that his early evolution took place in a semi-tropical environment. In the absence of clothing, housing and other means of protection, a temperature of 24°C-29°C with moderate humidity and low air movement, seems most satisfactory for his comfort and least likely to cause physiological disturbances. Human beings make physiological adjustments much more readily to semi-tropical than to arctic conditions. For rapid adjustment, enormous changes in blood flow through the capillaries can occur within a few minutes and regulate heat loss upward or downward as needed. For more prolonged temperature control as required by change of season, heat production can be regulated by lowering the metabolic rate. Vigorous physical exertion in humid heat causes an increase in pulse rate, in skin and body temperature and in sweat production while adjustment in a very cold climate depends on proper clothing and housing and cultural skills rather than on physiological processes. Man meets a fall in temperature by an increase in body insulation through peripheral vasoconstriction then by an increase in metabolic rate.

On the other hand, the various races and geographical groups of men differ markedly in their response to climatic conditions. Southerners commonly show greater ability than Northerners to work in heat, with less rise in metabolic rate, less expenditure

of energy and less profuse sweating. It is probable, nevertheless, as striking as these differences are, they are not so much the expression of genetic differences as of acclimation brought about by life in a hot or cold climate. In fact, genetic adaptation to cold is probably of small importance in man. By learning to build fires and to wear clothing, man became able long ago to survive in a cold environment without having to undergo profound evolutionary changes.

It is important to note here that man has used his habitat as an essential means of adjustment to both prolonged and sudden changes in climate that his environment imposes. It seems in many places that the body's physiological processes have been inter-plied with the dwelling and generally the pattern of the built environment. Changes in these patterns will induce physiological disturbances far from being ignored. The characteristic of bio-acclimation varies profoundly and hence has to be well considered as one major ecological issue. Interpretation of this understanding could immensely exhibit various techniques and arrangements in our design and could be traced with little patience in the vernacular, traditional, and primitive architecture all over the world.

7.4 NATURE

and its Implications on Man

The most popular employment of the word "nature" in modern studies is as a "catch-all" term for everything that is not regarded as man-made. Its interpretation is subjective and emotional (Yi-Fu Tuan 1971). Nature is wilderness, but it is also 'countryside', despite the fact that countryside is, in many instances, a human artifact. In fact, the words 'nature', 'wilderness', and 'countryside' are practically interchangeable.

7.4.1 Man's Attitudes to Nature

Three general orientations have characterised man's attitude to nature, and these are:

- 1) People as subjugated to nature: in non-industrial societies, or societies living in excessively unpredictable climates, people feel they live under the control of nature. They view environment as powerful, uncontrollable and unpredictable. All they can do is adapt the good and the bad from the environment. People in areas exposed to earthquakes, floods, strong winds and so on interpret these disasters as the "will of God" or they believe they may influence deity by praying and believing properly, but still feel powerless and subject to the will of God or nature. Similarly, farmers feel a sense of subjugation to nature in time of drought, and those adjacent to desert are afraid of it because of its uncompromising demands, its uncontrollability and its threat to human survival.
- 2) People as above nature: This orientation views humans as separate from nature, superior to it and hence having the right to adjust, control and subjugate the environment in accordance with human needs. This view prevails in many facets of western societies through its food production, use of natural resources, land use,

and exploitation of earth, etc., which provide a feeling of control over nature.

3) People as part of nature: This view, prevalent in many contemporary and historical cultures, states that humans are an intrinsic part of nature. Natural events occur predictably, and people's lives flow in a clocklike and orderly way. One cannot impose oneself on nature, rather one must flow with it, be part of it, understand its changing patterns, and adapt to natural events and properties.

7.4.2 Ideas of Nature

Under this title Raymond Williams wrote his article in which he started by questioning whether we mean to include men when we talk about nature. He emphasised that his intention is to say that the idea of nature contains, though often unnoticed, an extraordinary amount of human history (R. Williams, 1972). Like some other fundamental ideas which express man's vision of himself and his place in the world, nature has a nominal continuity, over many centuries, but can be seen, in analysis, to be both complicated and changing, as other ideas and experiences change.

Many of the earliest speculations about nature seem to have been in a sense physical, but with the underlying assumption that in the course of the physical enquiries one was discovering the essential principle. The multiplicity of things, and of living processes, might, Williams suggested, then be mentally organised around a single essence or principle: nature, a singular abstraction which was a major advance in consciousness. We have become so used to it in a nominal continuity over more than two millennia that we are unable to know quite all that it may commit us to.

R. Williams believes that although this singular name for the real multiplicity of things and living processes may be held to be

neutral, it offers from the beginning a dominant kind of interpretation: idealist, metaphysical or religious. From many early cultures, hence, we have records of what we would now call nature spirits, or nature gods: being believed to embody or direct the wind or the sea or the forest and so on. But soon nature herself became a goddess, a divine Mother, something very different from the spirits of wind and sea and forest and moon. It is more striking that this often personified principle, based on responses to the physical world, had a competitor: the monotheistic God. And the history of that interaction is immense. But even men who were prepared to dispense with the first principle, usually retained and even emphasised that other principle, the singular, abstracted and personified, Nature.

Nature may be a single thing or a force or a principle, but then what these are has a real history (R. Williams, 1972). To know nature was to know God, although there was radical controversy about the means of knowing: whether by faith, by speculation, by right reason or by physical enquiry and experiment. But Nature the minister of God was preceded and has been widely succeeded by Nature the absolute monarch. Nature's powers are so great, and their exercise at times so apparently capricious, that we make no pretensions to control. On the contrary, we confine ourselves to various forms of petition or appeasement: the prayer against storm or for rain; the superstitious handling or abstention from handling of this or that object; the sacrifice for fertility or the planting of parsley on Good Friday.

Yet the simplifying ideas of nature continued to emerge. God's deputy, or the absolute monarch, were succeeded by that nature which is a less grand, less imposing figure brought about with the

development of the sciences of the seventeenth to the nineteenth centuries. In the increasing secularism of this new emphasis, the singular personified nature became, though still singular, mere object, even at times a machine. The early sciences were predominantly physical: that complex of mathematics, physics, astronomy and so on. What was mostly observed was a fixed state, or fixed laws of motion. But this image has been changed. What changed this emphasis of fixed state was the evidence and the idea of evolution: natural forms had not only constitution but a history. Again the most important question was whether nature in this evolutionary scope included man; whether man could be properly seen in terms of natural processes or could he be described in the same terms as animals. And yet it can be seen as an unreal argument. For many millennia men had been intervening, had been learning to control. From the discovery of farming and the domestication of animals this had been consciously done, quite apart from the many consequences. We grew in confidence in our desire and in our capacity to intervene (R. Williams, 1972). To speak of man intervening in natural processes is to suppose that he might find it possible not to do so. Nature has to be thought of as separate from man. And then, Williams says, this is what we can see happening, in the development of the idea. What we can now call the more secular and more rational ideas of nature depended on a new and very singular abstraction: the abstraction of Man. It is not so much a change from a metaphysical to a naturalist view as a change from one abstract notion to another.

R. Williams believes that nature has to be seen as separate from man. One major reason for this will be the practical distinction between nature and God: that distinction which eventually made it possible to describe natural processes in their own terms; to examine them without any prior assumption of purpose or design, but simply

as processes. We could see better how it worked by altering or isolating certain conditions, in experiment or in improvement. Agricultural improvement, the industrial revolution, followed from this emphasis, and many of the practical effects depended on seeing nature as a set of objects, upon which men could operate. On the other hand we have to remember some of the consequences of that way of seeing things. Isolation of the object being treated led and still leads to unforeseen consequences.

Yet another and now very popular meaning of nature emerged. Nature, in this new sense, was in another and different way all that was not man: all that was not touched by man, spoilt by man: nature as the lonely places, the wilderness. This wild nature is essentially peaceful and quiet and few people going to 'nature' go to these untouched places. The nature here is innocent, it contrasts with man, except with the man looking at it. But a considerable part of what we call natural landscape is the product of human design and human labour, and in admiring it as nature seems to Williams to matter very much whether we suppress that fact of labour or acknowledge it. Hence some forms of this popular modern idea of nature depend on the suppression of human labour. In this sense it is, thus, very easy to contrast what can be called the improver of nature and the lover or admirer of nature. It is at this time that nature is decisively seen as separate from man.

According to the improver's idea, the operation on nature was producing wealth, and objections to its other consequences could be dismissed as sentimental. The improver's claim, however, that nature in any other sense than that of the improver's field to the margins: to the remote, the inaccessible, the relatively barren areas. Although the aim of this article is to trace the development of the various ideas of nature, this modern idea of nature has serious

implications for various aspects which can be studied in chapter one of this thesis. Suffice it to say that as the exploitation of nature continued, on a vast scale, the people who drew most profit from it went back to where they could find an unspoilt nature, and to the country refuge. Generally the point that has to be made about the separation between man and nature which is characteristic of so many modern ideas, is that the separation is a function of an increasing immoral exploitation of nature rather than a function of increasing interaction as some like to put it.

7.4.3 Implications in Architecture

It might seem quite a difficult task, tracing the implication in architecture of the various ideas of nature across history for several reasons. Yet it is not an impossible task. In the beginning, each society developed its own idea of nature, affected, not by some kind of acculturative dogma, but by its own physical setting, i.e. greenery, forests, stars and sky clearance, volcanos, etc. and in isolation from other societies' ideas of nature. It seems likely that there might have been other local ideas of nature, developed during the various cultural periods along with some political and social attitudes that have disappeared for the very reason of discarding the permanent geographical effects. On the other hand, it is of great interest to find out that some architectural characteristics which prevail in certain countries are the surviving interpretations of ancient ideas of nature in the history of that country.

For example, attention has always been drawn to the symbolic meaning of the Sumerian and Babylonian ziggurat. The names borne by different ziggurats: House of the Mountain, Mountain of the Storm, Bond between Heaven and Earth, imply that they created a link

between heaven and earth (Frankfort, 1954). Frankfort suggests that during the Assyrian and Babylonian empires, their relation with cosmic symbolism came to the fore. The Seven Terraces of Etemenanki, thought to be the Tower of Babel, each of a different colour, were supposed to relate to the spheres of the seven planets. But these possible astrological indications have been developed into the late significance of the ziggurat as the earthly throne of the god.

We might connect ancient religions in Mesopotamia and ideas strongly held towards nature. Early, precise observations of the ever shining stars and their movements reflect a longing to establish the interdependence between stars and earth, stars and man (S. Giedion, 1964). The connection between the sun and the seasons of the year was manifest; the connection between the moon and the earth, the moon and growth, was more mysterious. There was a deep concern about nature. In that, there was a god for each natural phenomena. Thus the ziggurat was normally dedicated to the god to whom the city "belonged" - in Ur the moon-god, Nannar, in Eridu the water-god, Enki, in Nippur the storm-god, Enlilite. This introduced a notion of eternity (S. Giedion, 1964).

The notion of a ladder between heaven and earth was marvelously portrayed. Characteristically, it was not the satisfaction of purely material needs but the desire for a symbolic realisation of the link between god and man that gave rise to this new and expressive architectonic form. Giedion suggested that a building of a ziggurat's height is a very limited goal. But men are obliged to use limited means to project limitlessness, and the desire for eternity - for limitlessness - was manifested by a limited edifice. Building was a sacred enterprise - it was the medium of union between man and god. Throughout the existence of the land of the two rivers, the

ziggurat remained the central monument of its religious cult. It was held in high esteem in every period: Sumerian, Akkadian, Kaysite, Babylonian, Assyrian. Though very serious and maybe controversial, it looks as if its influence has left some traces in the form of the Islamic minaret (See FIGURES 8,9,10,11). In spite of the fact that the minaret's function was essentially to enable man to call for the prayers, it was developed in late Islamic periods to achieve symbolic meaning; verticality leads to heaven.

One can say that for several centuries space conception in Mesopotamia has not even slightly changed. In Islamic architecture, however, the dominant principle has always been 'Form follows space, and space is adapted to function' (Abudlla Yahia Bokhari, 1980). In other words, once the function was given in the traditional Islamic architecture, the space which will freely serve that function has first to be created, then the form is nothing more than a corollary. Although the actual explanation for this might be a consideration of climatic and other physical effects, it has been attributed to conformity with the spiritual Islamic attitude in which the essence of things is not its form or shape, but usually hidden deep inside the body (ibid.). Bokhari stated that the inner is more essential than the outer, and the inner is the determining factor. An inward-looking architecture is perhaps the true philosophical meaning of Islamic architecture. However, one should know that the manifestation of such an attitude is not new. Most, if not all, ancient buildings, especially courtyard houses of Ur, Eridu, etc. embodied the same conception of space. The inward architecture of Mesopotamia first appeared in the beginning of the fourth millennium and has been adopted in the various cultural and religious epochs of that country. A fact which indicates that some permanent influence might have been behind the survival of this architecture and has

to be basically related to the relatively unchanged idea of nature prevailing in this area and its spiritual and religious interpretations (See FIGURE 12). Furthermore, it was stated, space conception in the Islamic perspective is that of the infinite space given to a man in a cosmological sense (oriented towards the sky), and he must attempt to recreate it in a microcosmic dimension (Ibid.). Man-made space, therefore, is only a part of the infinite cosmological space. The vast expanse of the space of the hypostyle mosque, for example, is only a representation of the unifying force of Islamic monotheism to create an allusion to infinity and unity. It has been pointed out that the main characteristic of the masjid design in its first age (Bosra in 635, Kufa in 639 and Fustat in 642) was the creation of a space which served exclusively Muslim purposes (O. Grabar, 1969). He pointed out that all the masjids of the second stage, between 650 - 750, were built in the hypostyle type of construction with columns as the main units of construction and bays framed by two or four piers as the module which allowed an almost infinite growth of the building in any direction. It might seem striking to find the same opinion held by S. Giedion when describing ancient Egyptian, Sumerian and Babylonian buildings. Giedion stated that

"the great hypostyle halls with their forests of papyrus-columns, blue-painted ceilings, and dim lighting were not conceived as enclosed interior spaces. This is everywhere apparent from their tectonic treatment. The papyrus-columns . . . do not represent a supporting scaffolding, as columns do in Greece . . . The columns appear as freely growing plants, without indicating that their heads act as supports . . . The Egyptians, like the Babylonians, considered the temple ceiling as a heavenly vault . . . In the imagination of the Egyptians the flat-roofed hypostyle appeared open to the sky even when covered over."

This notion of infinity in Islam as well as in ancient times can offer a simple explanation. No doubt it can be simply explained in

terms of prolonged exposure to an ever starlit sky at night and mostly clear and sunny skies during the day almost the entire year. It can be explained also in terms of living in a vast and limitless desert and flat plains, of no visual obstacles where sight can be extended freely to infinity. From this point of view, ideas of nature and religious attitudes which were developed in this particular area should have been and still are considered as one major design determining factor evidenced in many existing Iraqi traditional towns today. It might seem necessary to cite further examples of the architectural interpretation of ideas of nature, but no doubt this task requires itself further and more elongated research than the present study allows time for as well as for numerous other presented notions.

7.5 THE ECOSYSTEMS

and Natural Laws

Man lives in an environment distinguished by its various systems. Ecosystems have been defined as "functioning interacting systems composed of one or more living organisms and their effective environment (F.R. Fosberg, 1963). When applied to man, they are defined as the study of biological and cultural man living in and interacting with his environment. This study is very useful, in that it delineates the hierarchy of organisational units, the quality of stability, and the Gestalt properties of complex man-environment transactions within a single framework, thus making possible the delineation of principles of form and process (P. English & R. Mayfield, 1972). It was suggested also that the major advantages of ecosystems, as compared with other organisational concepts such as region or landscape, are as follows. First, they treat man and environment within a single framework; second, they are structured in a rational way; third, they analyse the functioning of systems, not simply their form; and, finally, they are a special type of general system with all that implies (ibid.). There have been some specific studies which can be cited as examples. One of them is written by Clifford Geertz which I summarise here.

In two types of ecosystems, Geertz describes the two basic agricultural systems of Indonesia: 1) SWIDDEN, slash and burn cultivation, and 2) SAWAH, terraced rice farming. Using an ecosystem framework, Geertz treats the interaction between specific variables of culture and environment to identify the processes by which these interactions are regulated, and to relate these concepts to the functioning of the system - in this case Indonesia - as a whole. Swidden agriculture is a multicrop system with a highly diverse regime, a cycling of nutrients between living forms, a closed-cover architecture,

and a delicate equilibrium. By contrast, terraced rice farming (SAWAH) is an open-field monocrop with a highly specialised regime, a heavy dependence on water-bourne minerals for nutrition, a reliance on man-made irrigation systems, and a stable equilibrium. By analysing these ecosystems in detail, Geertz is able to associate their basic characteristics with the uneven distribution of population in Indonesia and with the derivative set of social and economic quandries that have beset Indonesia for a century (C. Geertz, 1963). This is just one specific example, but world societies are basically distinguishable because of interactions, each with its own set of ecosystems. Therefore, population density and distribution, and the consequent economic, social and cultural structures are strongly associated with these varied systems.

The ecosystem concept was first applied to interaction between plants and animals and between them and the environment. It was observed that animals and vegetables live according to a system: they disturb the order of things in the service of their existence, and then restore the order by terminating their life. They live by changing the form of matter, but only within such limits that the form can be restored again. In nature, living creatures are so organised that they are unable, however numerous the species within a community, to damage their environment so as to destroy themselves or it (E. Hyams, 1952). It was observed that the hierarchical structure of food webs is not confined to organic components of the environment, nor is it confined to living plants and animals. Green plants rely heavily on the surrounding atmosphere for carbon dioxide and on the underlying soil for water and nutrients, so the physical environment is an integral part of the system. Furthermore, plants die and their structures are broken down by decomposer species to release energy and chemicals within plant organs and cells;

animals produce waste materials and they eventually die, and these both produce organic material which can be broken down. Man produces waste, and he also dies and is broken down slowly after burial or instantly at cremation. In this way decomposition is a fundamental part of the ecological system. The various parts of this hierarchal structure are linked to each other functionally to produce a dynamic system of inter-relationships between organisms, and between organism and environment.

It was Tansley who proposed the term "ecosystem" for this dynamic structure. He visualised the ecosystem as being composed of two major parts. In his view, all parts of such an ecosystem - organic and inorganic - may be regarded as interacting factors which, in a mature ecosystem, are in approximate equilibrium; it is through their interactions that the whole system is maintained (Tansley, 1935). The ecosystem is thus the sum of all natural organisms and substances within an area, and it can be viewed as a basic example of an open system in physical geography. Thus for example, the woodland ecosystem has a series of major inputs and outputs. The former include energy, rain water, soil minerals and soil water; the latter include the standing crop of timber and logs, animals within the system which migrate, water loss and heat loss.

Ecologists have considered and developed more notions concerning many aspects of ecosystem since Tansley's formulation of the concept. Hence, since then many ecologists have regarded ecosystems as the basic units of ecology because they are complex, inter-dependent and highly organised systems, and because they are also the basic building-blocks of the biosphere (C.C. Park, 1980).

With the increasing concern with the integrity of environment and the emerging problems which stem from man's economic and social activity, there is greater demand for the application of the

ecosystem concept within human community studies. A most relevant concept within the ecosystem approach to human affairs may be the concept of an ecological niche, that is, in a stable ecosystem, each species will have established itself in a given location within the system. In other words, it has access to a given source of energy. Green plants derive their energy directly from the sun; animals derive energy indirectly through eating and absorbing energy bound into complex organic molecules within green plants. In this way ecosystems tend to have relatively stable populations of species and relatively stable food web (energy) networks. Niche is used to mean the role played by a species within a community or it is used to refer to the distributional relationships of a given species to a range of environments (a habitat concept). There are two important characteristics of ecological niches which make the concept of fundamental concern and relevance to human environmental management. One is that the greater the diversity of niche within an ecosystem, the greater the diversity of energy flow pathways, and hence the more stable the ecosystem. Fluctuations of species populations within the system will be less extensive than those in systems with less diverse niches because predators have a wider choice of prey. The second is that the removal of a species often leaves a niche empty and this can soon lead to a reduced energy flow through the entire system, which can radically affect the structure and stability of the ecosystem as a whole. Species can be removed from ecosystems in a variety of ways such as through pollution, over-exploitation, loss of habitat or induced local environmental change (C.C. Park, 1980).

7.5.1 Man and Ecosystems

The ecosystem concept is of considerable value for evaluating the effects of human activities on the environment. Controlled management of the human population, together with the resources and life support system on which it depends as a single integrated unit, now becomes the greatest, and certainly the most difficult, challenge ever faced by human society (Odum, 1974).

Many ecosystems are now to some extent controlled by man. One characteristic of such a man-dominated system is that the distribution and function of human ecosystems are controlled by economic, social and political factors rather than by factors of the natural environment. In his discussion of island ecosystems, Rappaport traces the evolution of the pristine ecosystem into human ecosystems as they are altered by man. Migrating human populations introduced new plants and new organisms into the islands of the Pacific, altering the composition of local ecosystems either intentionally or inadvertently. The extent of impact varied; occasionally pre-existing species were replaced or eliminated, more often the biological complexity of the system was simply enriched. The high islands by and large were most susceptible to human alteration. Throughout the discussion, Rappaport suggests the range of possible conditions generated by human modification of existing island systems, and thereby identifies the importance of viewing these interactions within an ecosystem framework in order to gain insight and avoid error (D. English & R. Mayfield, 1972). (For further examples, see Article 1.5.2).

7.5.2 Natural Systems and Architecture

It has been stated that it is convenient to visualise the earth, its local environments and its living components as a set of inter-locking systems, at various scales and of varying complexity, forming a nested hierarchy so that they are all to some extent mutually inter-dependent. (There are energy systems, water systems, natural element cycles, etc.) (Walton 1968; Chorley & Kennedy, 1971). This approach provides a unifying conceptual framework with emphasis on the flow of energy within the systems, and by evaluating the processes of each system the approach provides a good tool for preventing adverse environmental effects and for suggesting methods for restoring degraded environments. It is extensively significant also in the understanding of how to utilise the various processes or attributes of the system in maintaining natural resources of energy or thermal comfort, by developing specific building arrangements and patterns appropriate for this purpose. There are numerous examples one can find within traditional architecture of the world. For example, in the arid zones traditional construction is found to demonstrate a folk knowledge of the thermal performance of the walls and roof, which are exposed to maximum solar radiation. Thick heavyweight construction is the norm, combined with small openings usually at high level. The thick heavy wall is used to give a time to the heat passing through from the outside to the inside surface. The temperature of the inside surface of the exposed walls and roof should not start to rise until the outside air has cooled after sunset. If it is too cool outside for comfort then the stored heat in the structure may be used to maintain a higher and more comfortable temperature inside by keeping the windows closed. If, on the other hand, it becomes too warm

inside, then the windows can be opened and the cooler outside air used to disperse the heat and reduce the inside temperature to a more comfortable level. If the exposed solid walls are too thin the time of delay will be too short and the temperature of the inside surface will rise too high too soon and the interior will heat up in the afternoon while the outside air is still too hot to bring any relief (M. Danby, 1980). Danby mentioned that this is frequently the case with modern construction of burnt brick or poured concrete. He argued that some designers have attempted to ameliorate the situation and avoid the need to depend on air conditioning or other expensive mechanical means of cooling, by introducing the use of cavity walls, which were originally developed in colder climates to improve insulation and resistance to damp and driving rain. Experiments, he argued, made in Khartoum with a special test building showed that a cavity wall performed thermally no better than a solid wall of the same total thickness!

Here are two ingenious examples which exhibit an optimal utilisation of natural laws in order to achieve tolerable and comfortable living conditions in a severe climate of the arid zone of Lybia and Iraq. Both cases are based on a simple fact concerning air movement. The temperature of the surface film of air above a flat roof may drop below the air temperature at night and can be utilised to cool internal and external spaces. During the day, the surface is heated and the heated air rises by natural convection. At night, the cooled air remains on the surface due to its increased density. To trap this air and utilise it, a wall is erected to prevent the cooler air flowing off the edge of the roof. The wall also reduces air movement which would limit the formation of cool air pools by mixing the cooler surface air film with air at normal temperature. Thus windows are provided in the roof so that the cooled air would

flow down to the interior when it was cooler than the internal air. Such an arrangement is used in certain buildings in the Sahara where rainfall is negligible (M. Evans 1980).

Another simple way of utilising the cooled air is the one used in the courtyard house in Iraq, where it is let to sink into the small enclosed courtyard. This acts as a basin, trapping the cooler air and allowing it to flow into the rooms around the courtyard, while heated air from the rooms of the courtyard rises up. Courtyards usually are surrounded by open railings with low kerbs to allow cool air to flow into them (See Figure 13).

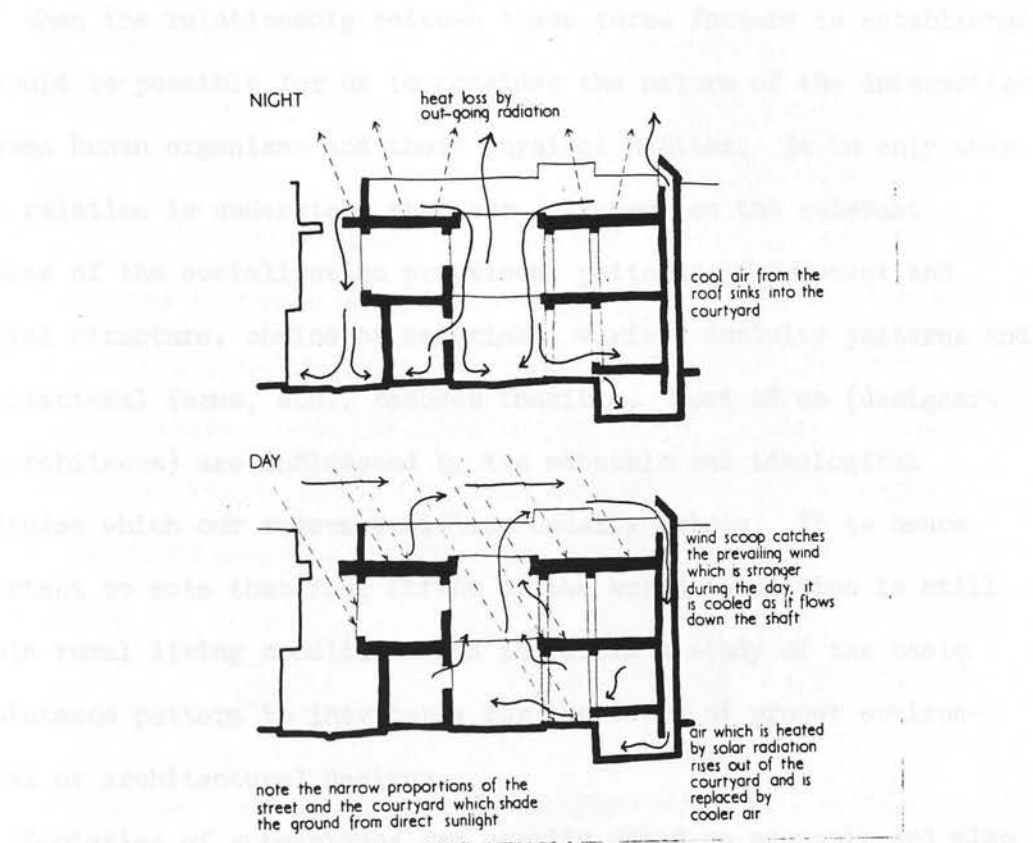


FIGURE 13

7.6 RESOURCES AND ECONOMIC POSSIBILITIES

This is a major factor that has been widely used, not only to explain settlement and building characteristics, but also the various activities and land uses. It has been extended to explain the social, political and cultural phenomena themselves. Though questioning its determining role, Rapoport stated that in an economy of scarcity the need to survive and to use resources maximally is so great that those forces may be expected to wield tremendous power.

7.6.1 Economic Possibilities, Population Size and Settlement Pattern

When the relationship between these three factors is established, it would be possible for us to consider the nature of the interaction between human organisms and their physical habitat. It is only when this relation is understood that our judgement on the relevant aspects of the socialisation practices, patterns of movement and spatial structure, choice of materials, various activity patterns and architectural forms, etc., becomes feasible. Most of us (designers and architects) are influenced by the economic and ideological attitudes which our modern societies usually embody. It is hence important to note that four fifths of the world population is still within rural living conditions and therefore a study of the basic subsistence pattern is inevitable for the issue of proper environmental or architectural designs.

Societies of subsistence are usually rated on economic and also on settlement patterns and placed in four categories: fully nomadic, semi-nomadic, semi-sedentary and fully sedentary (Murdock 1969). This dimension and categorisation essentially allocates the societies to (respectively) those who move continuously; those who move regularly but occupy a fixed settlement for a single reason; those

who move less often, but regularly move from one fixed settlement to another fixed settlement; and finally those who occupy a single settlement for a very long period of time. The basic point here is that certain levels of physical environmental conditions (temperature and rainfall) will permit human organisms (with their needs for living and shelter) to engage in certain economic pursuits. For example, if people are to occupy an area of low rainfall and low temperature, where agriculture is not possible, the economic base is limited to hunting or fishing. At the other extreme, where there is high temperature or rainfall, agriculture, pastoral and hunting patterns of exploitation are all possibilities. We may conclude, then, that the physical-environmental factors such as temperature and rainfall provide a clear set of economic possibilities which human organisms, in an attempt to meet their primary needs, can pursue (J. Berry 1976). Berry suggests that these economic possibilities, mostly related to resources of water and temperature, are not limiting, but for certain reasons appear to encourage societies to adopt an exploitive pattern involving cultivation, where the possibility exists. Hence we find cities were often confined mainly to the valleys, rivers and flood plains like the Nile, the Fertile Crescent, the Indus, etc.

7.6.2 Historical Preview

Whether we look at the city morphologically or functionally, we cannot understand its development without taking in its relationship to earlier forms of cohabitation which go far back in history. Probably the best study of this topic is presented by Lewis Mumford in his essay 'The Natural History of Urbanisation'. Mumford suggested that the tendency toward formal cohabitation and fixed residence gave rise, in Neolithic times, to the ancestral form of the city:

the village, a collective utility brought forth by the new agricultural economy. The villages exhibit their essential features: the encircling mound, setting it off from the fields; permanent shelters; storage pits and bins; with refuse dumps and burial grounds, recording silently past time and spent energy. Though the number of families is greater comparing with the pastoral economy, such settlements bring with them no serious disturbance in the natural environment; indeed, Mumford says, the relation may even be favourable for building up the soil and increasing its natural productivity. Many early cities, especially in Mesopotamia and Egypt, maintained the symbiotic relation with agriculture that we find in the village. It was the improvement in plant cultivation and stock breeding that made the emergence of the city from the village possible. It came with Neolithic culture; in particular, the cultivation of grains that could be produced and kept over from year to year. One may speak of wheat cities, rye cities, rice cities and maize cities, to characterise their chief source of energy. When Neolithic man escaped from a subsistence economy, it was possible to draw a larger number of people into other forms of work and services: administration, the mechanical arts, warfare, systematic thought and religion. So the once-scattered population of Neolithic times, dwelling in hamlets of from ten to fifty houses, was concentrated into cities. These early cities bore many marks of their village origins, for they were still in essence agricultural towns: the main source of their food supply was in the land around them, and until the means of transport had greatly improved and a system of centralised control had developed, they could not grow beyond the limit of their local water supply and their local food sources. Meanwhile, the tendency of cities to grow along rivers or near accessible harbours was furthered, not alone by the need for easy transportation, but by the need to draw on aquatic

sources of food to supplement those produced by the soil.

The village and the small country town are historic constants. One of the outstanding facts about urbanisation is that urban population until 1930 was only about a fifth of the total population; the remaining still lived under conditions approximating that of the Neolithic economy. These "Neolithic" conditions include the utilisation of organic sources of energy, vegetable and animal, the use of a local supply of drinking water, the continuous cultivation of land within walking distance of the village, the partial use of human dung along with that of animals for fertilisation, a low concentration of inorganic refuse like glass and metals, and an absence of air pollution. Many villages in the world now occupy barren hill sites of little use for agriculture; the stony outcrop of an Italian hill town involves only a slightly more symmetrical arrangement of the original rock.

7.6.3 The Present Perspective

The relationship between man and his environment has gradually changed over time from a condition of integration to a condition of domination over nature and its resources and the native economic possibilities. This change took place with the development of the necessary technique for agriculture, fishing, hunting, and the domestication of plants and animals. In fact, many of the resources and economies which essentially influenced the development of cities or its basic and structural institutions - political, social and physical - have been replaced by economics and resources produced by man himself. Modern urban tradition has been moulded by a combination of economics, technological and political influences and values. The idea that cities should be required to produce such basic essentials as food involves a shift in values usually thought to

be underlying city morphology and function. From this perspective, urban environment became the generator of vast resources in nutrient energy and land. The sewage treatment plant, food industry and the leaf litter services provide potential resources for enriching soils for gardens, parks and so on. With this situation the various natural limits of the growth of cities and determination of the settlement's physical pattern were thrown off: the nutritional limit is replaced by massive production of manufactured food; the defence limit of protection by walls or natural barriers is replaced by modern techniques of defence; the traffic limit set by slow-moving vehicles or means of transportation and so on. Having thrown off natural controls of economy and limitations, modern man must replace them with an at least equally effective man-made pattern. But there has been a marked growth of interest in the quality of this kind of man-made environment and the consequent disruption of the natural systems as well as the accelerating demands on resources due to growth of population and growth of new economics. The consequence of such a situation is so hard to predict but the least to describe as a major disturbance to people's images and the value of land and natural balance.

7.7 POPULATION SIZE, DENSITY AND DISTRIBUTION

7.7.1 Historical Background

Over some thousands of centuries, man has learned to modify and to exploit the environment to his advantage in many ways: to clear, to plant, to mine, to dam, to dredge, to domesticate animals, to breed varieties of plants and animals, to increase the yield of crops, fish and fibre he extracts from the natural system. But man did not succeed to do this alone. All these achievements have been an outcome of collective work which involved many groups of our ancestral human population. These ancestors had already 'invented' culture, a body of nongenetic information passed from one generation to another. But it is certain that the consequences of cultural evolution for the population size were minor compared with those that were to follow the agricultural revolution. There is firm evidence, provided by archaeology, that established village communities functioned only after discovering farming around the ninth millenium B.C. This step, accompanied by the development of relatively permanent settlements and food storage facilities, freed man from the constant search for food. Some members of early agricultural communities were able to turn to other activities. Wheeled vehicles appeared; copper, tin and then iron were utilised; and dramatic sociopolitical changes occurred along with urbanisation.

Gordon Childe argued in his 'Urban Revolution' that a revolution should be reflected in the population statistics. In the case of Urban Revolution the increase was mainly accounted for by the multiplication of the number of persons living together, i.e., in a single built-up area. The first cities represented settlement units of hitherto unprecedented size. It was not just their size that constitutes their distinctive character. By modern standards they appear

ridiculously small and we might meet agglomerations of population now to which the name city would have to be refused. Yet a certain size of settlement and density of population is an essential feature of civilisation. The density of population is determined by the food supply which in turn is limited by natural resources, the techniques for their exploitation and the means of transport and food preservation available.

7.7.2 Densities and Distribution

The density and distribution of populations, especially in relation to resources, have played a critical role in many important events in human history. Densities that are perceived by the members of populations themselves as "high" generate what is generally referred to as "population pressure". Overpopulation is, therefore, thought of in relation not to the absolute size of population but to its density. There must have been many thousands of occasions in prehistory when individuals of one tribe or another decided that their home territory was running short of berries or game, and moved in on their neighbours. Many of the famous migrations of history, such as the barbarian invasions, may have been due to such population - resource pressures. In the present time, population pressures are certainly contributing to many tensions in the world (Ehrlich, Ehrlich 1970).

However, population density in itself is not a good measure of overpopulation or underpopulation. Shortages of many resources other than physical space - such as water, fertile soils, suitable climate or mineral resources - may make it difficult to supply even a sparse population in a given area with the necessities of existence.

7.7.3 Population Size and Creativity

Once the creative man has produced an idea that strengthens man's relation to his environment there is a potential, and usually a real, population growth. This means that there will now be an increased chance for the occurrence of great creative minds. The assumption here is that creative minds occur as a proportion of population. As a result, one might expect that small populations must have very few creative minds. The creation of ideas by increasing the number of potential creators must, then, provide more opportunities for further ideas that should in turn further increase the population. Historically that is true, the very long lower Paleolithic period was one when little happened over great lengths of time. It was also a time of extremely low human population. As inventions were made and population began to grow, there were more men in contact with other men. More ideas were exchanged and the brighter men received greater stimulation from current ideas. In some areas the stage was reached where every man did not need to know or do everything, some men could specialise in certain occupations and not only become more skillful but could create better ways of doing things. Ultimately, growth of knowledge led to increases of productivity so that some men could be spared for such seemingly unproductive pursuits as astronomy, mathematics, map making and the like. These pursuits laid the foundation for even greater growth of knowledge (G.F. Carter). So Carter argued that men produce ideas. Ideas make it possible for there to be more men to produce more ideas. This feedback system may be unbelievably slow to start, but once it gains momentum its acceleration is exponential, and the long view shows just such a growth. We are currently experiencing such a situation - a population explosion accompanying our exploding growth of knowledge (G.F. Carter).

7.7.4 Population Size and Environmental Problems

If Carter considers such a situation as being normal, others do not consider it so (Ehrlichs 1970, John Black 1970, Holdren 1973, C.C. Park 1980). For them the explosive growth of human population is the most significant terrestrial event. This mass of humanity now threatens to destroy most of life on the planet. No geological event in a billion years has posed a threat to terrestrial life comparable to that of human overpopulation. However, interest in environmental quality has grown recently; the disruption of the natural ecosystem and the depletion of resources. The speed and nature of environmental change (especially man-induced change) in recent years has brought about a series of problems of global magnitude - including population expansion, energy resources and utilisation, the provision of food supplies, exploitation of raw materials and pollution. But much of the conflicting views are about whether a diminishing quality of the environment should be assigned to overpopulation or to failure of the social system and/or technology. The overpopulation school favours the notion that increasing population size, and hence increasing population density, places increasingly greater demands on the finite resources of the planet, and that there is thus a diminishing marginal return from population explosions such as that characteristic of the period after the Industrial Revolution. According to many authorities, population expansion is the key element in the man/resources/environment balance, and accordingly the concept of an optimum population has evolved to stress the balance between population size, available resources and prevailing social structure at the national and global scale.

7.8 LOCAL TECHNOLOGY

What gives technology its indigenous identity is that it evolved out of tools and techniques closely related to a culture's core. It was stated elsewhere in this study that cultural core comprises a constellation of features which are most closely related to basic and substantial activities and economic arrangements (J.H. Steward 1972). The development of technology is considered as a kind of adjustment of human societies to their local environment which requires particular kinds of tools and techniques and implies a certain mode of behaviour within the social administrative, or maybe at the level of culture itself. As stated previously, Steward argued that technologies developed in a certain environment may be used differently and entail different social arrangements in each environment. Thus, on a subsistence level, societies equipped with bows, spears, surrounds, chutes, brush-burning, deadfalls, pit-falls, and other hunting devices may differ among themselves because of the nature of the terrain and fauna. When agricultural techniques are introduced, man is partially freed from the exigencies of hunting and gathering, and it becomes possible for considerable aggregates of people to live together. We should notice, however, that larger aggregates made possible by increased population and settled communities provide a higher level of socio/cultural integration, the nature of which is determined by the local type of socio/cultural integration.

Hence Steward suggests that the interrelationships of technology and environment must be analysed. That is, the use of these technologies may not depend only upon cultural history, i.e. invention and diffusion, but upon the environment and its flora and fauna. We should also examine the extent to which the behaviour patterns

entailed in the use of these technologies affect other aspects of culture. The basic point to be understood here is that tools, techniques and other cultural types must be conceived as constellations of core features which arise out of environmental adaptations and which represent similar levels of integration. That will inevitably include building technology and tools, their entailed patterns of behaviour and the way they affect design ideas.

However, one can also find evidence in a specific culture that it is affected by the adoption of foreign traits. The result of the transition may range from a relatively slight change in virtual assimilation. The new "technology" is not usually used for the purpose of information transfer but rather by which the culture of the society in the subordinate position is gradually modified to conform to the values of the dominant society. However, such positions are not absolute, because the dominant group is also subject to the extent that it accepts elements from a less developed group, which may come from the other group (L. H. Small and W. H. Hall).

Historical Period

Certainly it is not this type of contact or assimilation that we are concerned with. In fact, certain specific cultural elements adopted certain aspects of ways of life, language, tools, inventions from the neighbors, which were found to be useful in its physical domain. Given this situation, it is not surprising that we may expect to find distinct processes and stages of development in its own peculiar environment. But the appropriate conditions and circumstances are related to the material objects they

7.9 LOCATION AND ACCULTURATIVE INFLUENCES

All cultures are in a process of change. Considerable attention has been given so far to change due to adaptation to environment, but another source of change in recent history has stemmed from the contact of people leading to the diffusion of cultural forms. John Berry stated that while it is true that many of these changes have been mutual, with both groups in contact having some influence over each other, it is also true that in most cases of contact the resultant changes have been far from equal in both cultures.

However, one can also focus attention on a specific culture and see how it is affected by the adoption of foreign traits. The result of the transmission may range from a relatively minor change to virtual assimilation. The term "acculturation" is most commonly used for the process of interaction between two societies by which the culture of the society in the subordinate position is drastically modified to conform to the culture of the dominant society. However, these positions are not absolute, because the dominant group is also recipient to the extent that it accepts elements (a tool, a food plant, a word, etc.) from the other group (J.O.M. Broek and J.W. Webb).

7.9.1 Historical Preview

Certainly it is not this type of contact or acculturation that we are concerned with. On many occasions certain societies accepted and adopted certain aspects or ways of life, borrowed tools, devices and inventions from its neighbours, which were found relevant and useful to its physical context. Gordon Childe stated that each society may be expected to evolve distinct processes and devices in response to its own peculiar environment. But the appropriate inventions and discoveries are not confined to the regions where they

were evolved. They do transgress the boundaries of locality, geography and linguistic convention; they can be diffused from one society to another. Childe found that the richness of a culture is largely due to diffusion, to the adoption of ideas created by many distinct groups in response to diverse conditions. Therefore cultures grow more and more diversified through the differentiation of societies in response to special stimuli - geographical, technological or ideological. They grow also with more intercourse and interchange between societies (G. Childe 1942). For example, in ancient Mesopotamia, the ability of the craftsmen - smiths, builders, weavers and so on - to migrate contributed materially to the diffusion of discoveries and the pooling of experience. The comparative uniformity of the very earliest metal products, anterior to the urban revolution, Childe states, may be explained as the result of such diffusion.

J.H. Steward writes that

"cultures do tend to perpetuate themselves, and change may be slow But over the millenia cultures in different environments have changed tremendously, and these changes are basically traceable to new adaptations required by changing technology and productive arrangements. Despite occasional cultural barriers, the useful arts have spread extremely widely, and the instances in which they have not been accepted because of pre-existing cultural patterns are insignificant. In pre-agricultural times, which comprised perhaps 99% of cultural history, technical devices for hunting, gathering and fishing seem to have diffused largely to the limits of their usefulness. Clubs, spears, traps, bows, fire, containers, nets and many other cultural features spread across many areas, and some of them throughout the world. Later domesticated plants and animals also spread very rapidly within their environmental limits, being stopped only by formidable ocean barriers."

Steward, however, suggests that whether or not new technologies are valuable is a function of the society's cultural level as well as of environmental potentials. All pre-agricultural societies found hunting and gathering techniques useful. Within the geographical

limits where these techniques were adopted. More advanced techniques, Steward mentions, such as metallurgy, were acceptable only if certain pre-conditions, such as stable population, leisure time, and internal specialisation were present. These conditions could develop only from the cultural ecological adaptations of an agricultural society.

The possible conclusion of the above discussion is that adoption of foreign techniques and ideas or their spread took place because of their usefulness to society and also because of conformity with ecological conditions. This situation which was persistent over hundreds of centuries has been drastically changed in recent history. For reasons mainly related to beneficial objectives of certain dominant societies, new ideas and technologies are now adopted disregarding their conformity with the contexts of the dominated societies. Jan O.M. Broek and John W. Webb wrote:

"The present century witnesses great modifications in non-Occidental cultures under the impact of western civilisation. In Japan, acculturation has gone quite far. If the term acculturation implies interaction in process, most would agree that non-Occidental peoples are largely in the position of recipients, thus becoming more similar to Occidental peoples. However, if we want to judge acculturation by the result achieved, we must reserve judgement. The process has not yet run its course, there may be recoils and reversals and conditions vary greatly from society to society."
(J.O.M. Broek and J.W. Webb).

(Some consequences of such acculturation with reference to architecture have been discussed in Chapter One.)

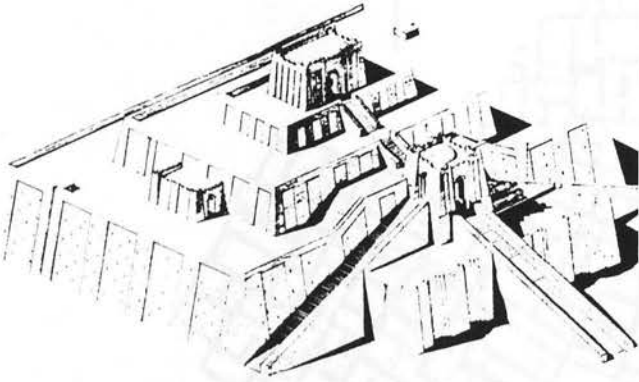


FIGURE 8 Sumerian ziggurat about 2500 B.C.



FIGURE 9 Great Mosque of Samarra.

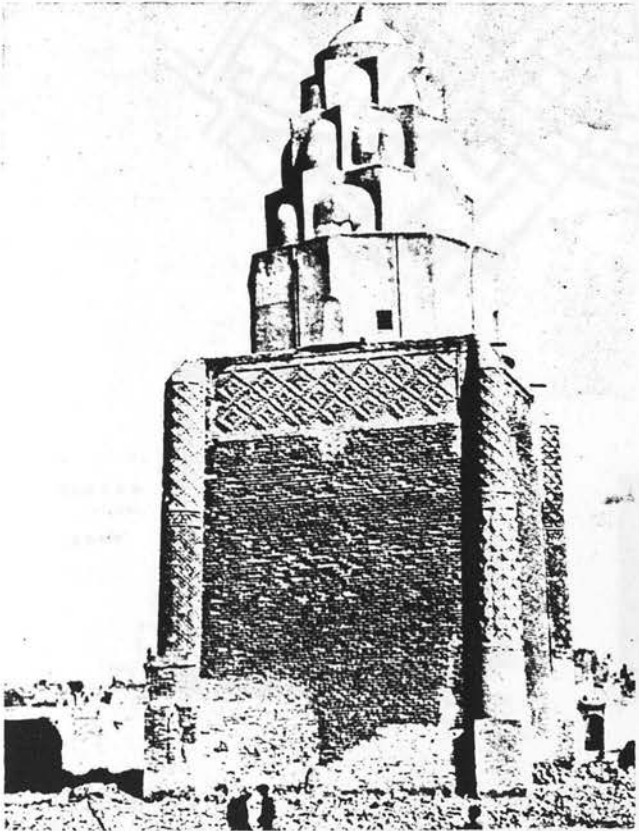


FIGURE 10 Imam Dur, Samarra.



FIGURE 11 Tomb of Sultan Qala'un in Cairo.

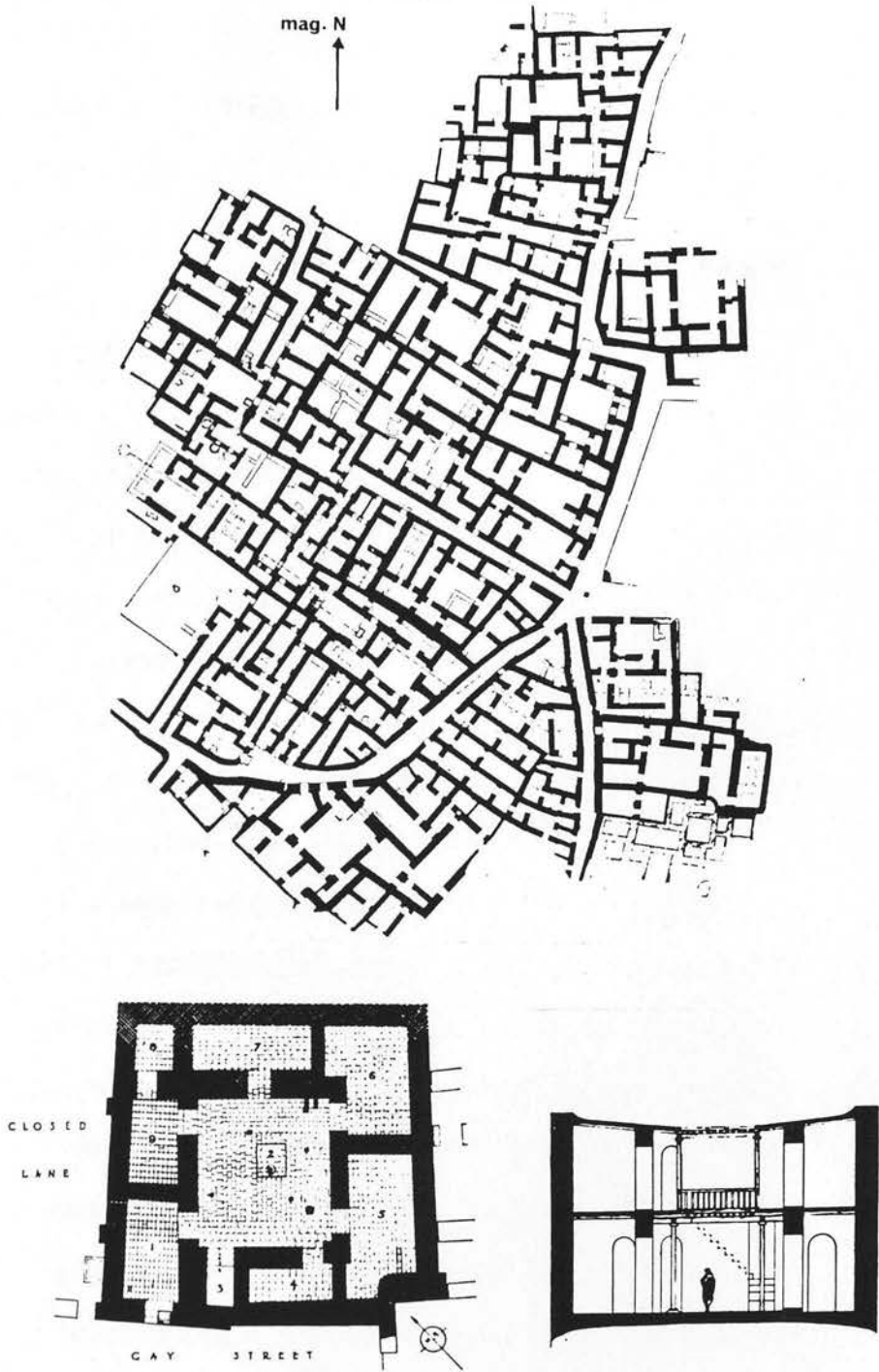


FIGURE 12 A residential quarter of Ur in the 20th Century B.C. Some houses have two storeys of rooms, lit by open court, and closely resembling those in the main cities of modern Iraq.

THE ECOLOGICAL FACTORS

(continued)

Chapter Eight

8.1 CLIMATE

Many anthropologists tend to reject determinism in cultural and architectural fields. Among those factors which play a prominent role in characterising traditional architectural building, however, is climate. The claim to discard its environmental significance arises, perhaps, from the fact that within the same climatic zone, one may find different architectural forms. Although the determinist view states that primitive man is more concerned with shelter, and consequently the imperatives of climate determine form, they argue that even this is not true! For example, many settlements have developed both the court house and other forms, as is the case in Greece (Rapoport, 1969). Rapoport also stated that elaborate dwellings are found in areas where, in terms of climate alone, the need for shelter is minimal. One may argue that in almost all cases not only one environmental factor determines architectural form. There are cases in which the way of life may lead to almost anticlimatic solution, and this may suggest that other ecological factors impinge rather more strongly than does climate. Like any other ecological factor, climate is looked at through the ability of man to utilise its various components to his interest. That is to say, there are within climatic conditions some ecosystems, such as the energy flow system, which require certain building arrangements to achieve thermal comfort for man, without the need for extra expense of energies by mechanical means.

There is much evidence that many of the modern solutions to climatic problems often do not work, and city buildings are made bearable by means of extremely expensive mechanical devices whose cost sometimes exceeds that of the building shell. One is struck

by the knowledge and discrimination of traditional builders across history, in the selection of sites and materials suitable to the specific local microclimate (Rapoport, 1969). In the present time the comfort provided by heating or aircooling machines is still problematical and may lead to unforeseen consequences in an over-controlled and uniform environment; people are not so much committed to the environment as escaping it. Rapoport suggests that "the poor thermal performance of many modern buildings, despite this mass of mechanical equipment, suggests that we cannot ignore the physical environment, and that we underestimate its continued effect on our cities and buildings".

Lacking technology which usually ignores adaptation to climate, the traditional builders were dealing with the creation of form and building techniques for a wide range of climatic conditions, with very limited materials and tools. These builders, Rapoport says, have gained the experience of dealing with problems by collaborating with nature. One famous architect stated after a visit to Africa, "I saw many huts that the natives made. They were all alike, and they all worked. There were no architects there. I came back with impressions of how clever was man who solved the problems of sun, rain, wind." Man with nature builds more wisely than with technology. He follows principles of design which many architects ignore at great cost. The principles, and in some cases the actual accomplishments, are of value; in any event, such attempts to solve the problems of climate must have important form consequences. Rapoport observed that scale of climate ranges from the need for no shelter at all, on climatic grounds, to areas with a maximum need for shelter. In each case the solutions will provide the maximum amount of protection in terms of the given technological resources and the socially and

culturally defined needs. He asserted that the more severe the climatic conditions, the more the form will be limited and fixed and less variation will be possible from what one could term 'pure climatic functionalism.' We observe more forceful, enlightening solutions in those areas where both climate and physical environment are difficult and severe. Examples of these are the Eskimo igloo, the mud house of the desert belts and raised floor houses of the tropical areas.

Builders under difficult conditions exhibit detailed knowledge of the forms, materials, and micro-climate of the area; they know the absorbent, reflective, and other characteristics of local materials for maximum comfort and their resistances to rain and snow. This is evident in the way they care about orientation and site under all kinds of weather conditions and at all times of day, how they consider local wind patterns, misty or foggy locations, shady and sunny spots, the movement of hot and cold air - and build their buildings accordingly (Rapoport, 1969). In spite of the fact that resources of materials, energy and technology were very limited, the margins for error and waste were correspondingly small and the results showed a high level of performance whether in terms of buildings or the total physical structure of the settlement. The solutions also show a vast variety of designs relating to living conditions as well as their cultural and symbolic interpretations of these conditions and their definition of comfort.

8.1.1 Climate Elements

Climate, as it affects human comfort, is the result of air temperature, humidity, radiation - including light - air movement, and precipitation. To achieve comfort, these factors need to be

handled in such a way as to establish some form of balance between the environmental stimuli so that the body is neither losing nor gaining too much heat, nor is subject to excessive stresses from other variables. In climatic terms, a building needs to respond to heat, cold, ground and sky radiation, wind and other factors.

8.1.1.1 Solar Radiation and Light

Solar radiation is the source of almost all the earth's energy and is the dominant element of climate. A part of it is reflected by the surface of the clouds, and part is absorbed by the atmospheric zone. As the surface of the earth absorbs energy, its temperature increases. The solar radiation varies greatly with the geographic location and the weather. In general, four channels of radiation affect building. They are: direct radiation from the sun, diffused radiation from the sky; radiation reflected from surroundings; and radiation from the heated ground and nearby objects. The effects occur in two ways: by entering through openings and through being absorbed by the outside surfaces.

8.1.1.2 Air Temperature

Air temperature varies from one side of a building to another, from shaded to unshaded areas, from green or paved fields to paved roads. The rate of heating and cooling of the earth's surface is the main factor determining the temperature of the air above it. At night and during winter the surface of the earth is usually colder than the air as a result of radiation to the sky, and so the net heat exchange is reversed and air in contact with the ground is cooled. In the hot, dry areas temperatures are high during the daytime and low during the night, a fluctuation best met by delaying the entry of heat as long as possible so that it will reach the interior later, when it is needed. This is achieved by the use of high heat capacity materials which provide a "heat

sink", absorbing heat during the day and re-radiating it during the night. It is well known, also, that humid heat areas are characterised by heavy rainfall, high humidity, relatively moderate temperatures with little daily or seasonal variation and intense radiation. The required responses are maximum shade and minimum heat capacity. Heat storage has no advantage when there is little temperature variation and heavy construction will hinder maximum ventilation, which is the primary requirement for helping the body lose heat. The requirements are almost the exact opposite of those for dry heat. The principles for keeping the cold areas warm are the same as those for arid heat except that the source of heat is here inside rather than outside and the attempt to stop heat flow is in the opposite direction. Heating the dwelling involves large stove elements, often located at the centre of the house. The loss of heat is avoided by use of a compact plan, minimum surface area exposed to the outside, heavy materials of good insulating capacity and prevention of drafts and air leaks. Snow builds up thick layers on roofs and thus affects the firm, size and strength of roofs. In cold areas the desire is to capture as much solar radiation as possible.

8.1.1.3 Wind

Speed, direction and frequency of calms are the important features of wind, which is a very unstable parameter in most parts of the world. The variability of the wind is revealed in both its direction, from which the wind comes, and its speed. The weather in any area is affected not only by air moving under the influence of hugh air masses, but also by local winds which are typical of that area and affected by local features such as mountains, lakes or the sea. Wind affects ventilation, can be used for cooling, can

cause driving rain, can carry dust and can require structures to be strengthened. But wind is also related to temperature and wind-speed, humidity and temperatures enter into the effective temperature which is used to measure comfort. We have noticed that the distribution and characteristics of the winds over a region are determined by several global and local factors. The principal determinants are the seasonal global distribution of air pressure, the rotation of the earth, the daily variations in heating and cooling of land and sea and the topography of the given region and its surrounding. Therefore, devices and means to cope with the impact of winds are differentiated with the prevailing type of wind in any region, reflected by various structures, forms, and other architectural arrangements.

8.1.1.4 Humidity

Humidity refers to the water vapour content of the atmosphere gained as a result of evaporation from exposed water surface and moist earth, as well as from plant transpiration. Temperature and humidity operate together as regards comfort. Where humidity is high, ventilation is used to help the body lose heat. Where humidity is low, water and vegetation can be used to increase it, in addition to humidifying devices which often involve the trickling of water over grass matting in the windows or the gardens.

Humidity affects many building materials and their rate of deterioration. Vapour pressure, on the other hand, affects the rate of evaporation from the human body. These two factors are expressed through many arrangements man has invented within his built environment. They vary according to the type of region regarding high or low level of humidity seeking to achieve better comfort. Material choices, landscape and plants, pavements,

building articulation and built densities exhibit determination to control the prevailing humidity conditions.

8.1.1.5 Precipitation and Rain

The main effects of rain are on the construction of buildings.

Arid areas tend to employ some means for catching rain and protecting it from evaporation. These devices are mostly accessible from houses and may have a cooling effect on the building and help to humidify it.

On the other hand, verandas allow windows to be open for ventilation while it is raining. The amount of rainfall affects the form of buildings in many areas, as well as many characteristics such as the elements to protect from rain, drainage devices, and so on. Arrangements are usually undertaken within the site and further into the whole settlement to drain the water.

8.1.1.6 Other Climatic Elements - Snow, Frost, Thunder, Lightening, Dust, etc.

It is far too difficult to suggest that those architectural characteristics of high aesthetical impact in many native areas of critical climatic condition such as the Alp mountains or the deserts, are not basically derived from climatic necessities.

For example, we have seen, elsewhere in this study, that differences in snow falls result in having the pitched roofs of different angles. For a while one would attribute such differences to mere abstract design ideas. It is often so significant to stick to a certain roof type in terms of its slope or materials for the very climatic reason.

On the other hand, in the desert regions the problem of dust entering the buildings is considerable. Such problem may be solved at several levels, through orientation, through organisation of the layout of dwellings, and through the details of design of individual building. Comfort is also achieved by a kind of adaptive arrangement such as restricting of outdoor activities to the mornings, late afternoons and evenings when dust is likely to be less than in other times. Sleeping outdoors in internal courtyards is also another example of adaptation to the climate.

However, building arrangements are found to meet more than just single effect of the climate. In the hot regions, the impact of climatic variations is met by the use of small windows and openings to avoid the excessive heat as well as the prevailing dusty storms specific to this zone.

Protection from thunder and lightning is a contemporary phenomenon. It is usually achieved by technical devices such as lightning conducts and the like. It is hard to find a natural way of avoiding the damaging effects of thunder or lightning through the arrangement of design idea or dwellings layout which go beyond the available local materials or resources in most of the native and non industrial societies.

8.1.2 Observation on Climatic Implimentation in Environmental Design

The variation in the state of climate can be increased or reduced by the design of dwellings and spaces around them. The forms of dwelling are planned so as to maximise or minimise incident solar radiation. The orientation and arrangement of buildings and external spaces can be carried out to admit cooling breezes or provide protection against cold winds. On the other hand, the choice of building materials and window shape can control internal temperatures. Buildings may have variable elements such as shutters, sunshades, and open planting; trees or vines may be used to provide shade in the hot season. In addition to thermal comfort there is the concern with lighting and visual comfort. Excessive light may be experienced at the same time as high temperatures accompanied by intense radiation. In high latitudes inadequate lighting is often associated with very low temperatures. Under these conditions direct sunlight is welcomed even though the heating effect may be small. In outdoor spaces, walls, trellis and overhanging roofs can be used to control heat and light as can the choice of surface colour and texture. Generally the conditions in which comfort is achieved can be defined by describing the combination of values of four factors: A) Temperature; B) Humidity; C) Radiation; and D) Air movement.

8.1.3 Architectoral Response to Climate

It is extremely difficult to cite here all kinds of arrangements or building devices which have been elaborated on in accord with climatic conditions. But it is quite possible to trace the climate's effects in the shaping and refining of enormous features

of both traditional and vernacular architecture. These features perpetuate themselves not only through establishing architectural characters of many towns, but most importantly their achievement of thermal comfort almost without cost. The following are considerations in terms of climate which usually affect buildings.

1) SITE SELECTION

Site selection was of primal importance in terms of thermal comfort. Site climate or microclimate relates to the climate of the area where the building of a settlement took place and is affected by many factors such as ground cover, slope, orientation and elevation as well as the nature of the terrain surrounding it. As solar radiation intensity varies according to the ground slope, this has founded certain arrangements in which dwellings are organised in such a way as to achieve greater benefit from it. The same goes for exposure to breezes or prevailing winds (M. Evans, 1980).

On the other hand, topography of places, that is the shape, orientation, exposure, elevation and hills or valleys, have an effect on temperature and distribution of solar radiation, wind and precipitation. It is also known that temperature in the atmosphere decreases in hot lands where temperatures may be more favourable at higher elevations. Proximity of water moderates extreme temperature variations; land near water will be warmer in winter and cooler in summer. Humidity may also be affected, depending on the general temperature pattern. So the larger the body of water, the greater its impact on the microclimate. Arrangements of buildings and their surroundings have been oriented in accord with the heat reflected by ground surface and can be distinguished from place to place. The portion of solar radiation

which reaches the earth raises the temperature of the ground - the amount depends on latitude, the season, the slope of the ground, the hour of the day and the nature of the terrain as we mentioned, and during the daytime the highest temperature is always found at the boundary between the ground and the air. The temperature increases considerably as one reaches the ground. At night, as a result of the loss of heat by evaporation and the effective outgoing radiation, the reverse is true and the temperature decreases as one approaches the ground. Specificity of microclimate, hence, is that the closer one approaches the ground the more extreme it becomes.

The effect of vegetation is quite considerable, especially in all hot-dry zones. Vegetation also provides protection against glare, dust and erosion. It also has disadvantages when too close to buildings. In general, physical features such as neighbouring buildings, walls, trees, etc., which may influence air movement or cast shadows, have played tremendous roles in affecting building orientation and articulation evidence also in vernacular towns.

2) ORIENTATION

Orientation of building is the direction faced by the external elevation. It was determined by many factors, such as location of economic and natural resources and topography, but mainly by the climatic factors of wind and solar radiation as well as by the view, noise, and requirements of privacy which sometimes intervened with climatic consideration. The orientation has been determined by the quantities of solar radiation falling on different sides at different times. Optimum orientation would reduce radiation to a minimum in the so-called overheated period, while simultaneously allowing some radiation during the cool months or the underheated period.

Building orientation also affects the indoor climate in two aspects: a) solar radiation and its heating effects on walls and rooms facing different directions, and b) ventilation problems associated with the relation between the direction of the prevailing winds and the orientation of the building.

But above all, early man was bound to the sun's cycle, and the rise of the beneficent sun was honoured ritually in many societies by facing important buildings towards its dawning rays.

The sun's movements were studied in Sumer and mainly in Egypt. Temples in many periods were found to be accurately aligned either with the cardinal directions, or their subdivisions.

Just as the seasons are strongly differentiated by the inclination of the earth's axis toward the sun, the orientation of a building is affected by the quantities of solar radiation falling on different sides at different times, as mentioned above. Hence the Mesopotamians, Ehyptians and classical builders were very keen about solar orientation, probably as much for reasons of health as of their sun-dominated religions.

3) MATERIALS: THEIR THERMAL PERFORMANCES

People were always aware of the role of materials within the building in separating the indoor space from the external environment. They have great importance in modifying or preventing the direct effect of climatic elements such as temperature, humidity, wind, solar radiation, rain, snow, storm, etc. The quantitative effect of the envelope depends on its 'thickness' and thermophysical properties. The material within the internal space, such as floors, partitions and even interior decoration and furniture also modify the indoor temperatures by affecting the heat capacity of the structure as a whole and the rate of absorption of heat generated or penetrating within the building.

Nature, texture and colour of external surface determine the amount of solar radiation absorbed in the structure during the day and the amount of heat loss into space at night (A. Rapoport 1969, Evans 1980, Olgyay 1963, Aronin 1953, A. Konya 1980).

It is also stated in the above studies that the effects of thickness and thermal resistance of the various building elements on the indoor climate are interrelated with the external colour and texture effect and depend on the diurnal variations in outdoor air temperature. Choices among various material used in building were mainly determined by the three primary thermal properties of these materials. These are: absorptivity: property of the surface which determines the amount of radiation falling on the surface that will be absorbed; conductivity: the rate at which certain materials of certain thickness allow the transmission of heat from one surface to another; and third the heat capacity: the amount of heat required to elevate the temperature of a unit volume of the element by one degree. In other words, materials are heated differently by the same quantity of heat, according to the product of their specific heat and density. Heat capacities of materials are significant when thermal conditions are fluctuating. When the structure is heated and cooled periodically as a result of variations in outdoor temperature and solar radiation, the heat capacity has a decisive effect in determining indoor thermal conditions. An example of the best use of this property is evident in the hot area's typical buildings such as the courtyard houses. However, the principles of thermal control through structure and material use are well illustrated by the way native builders exploit the limited materials available to them and work them into structural forms (Rapoport, 1969).

4) BUILDING FORM

People realised that in the upper latitudes the south side of a building receives nearly twice as much radiation in the winter as in the summer. The effect is even more pronounced at the lower latitudes, where the ratio is about one to four. Also, in the upper latitudes, the east and west sides receive about $2\frac{1}{2}$ times more radiation in summer than in winter. This ratio is not as large in the lower latitudes, but in summer there those sides receive two to three times as much radiation as the south elevation (Olgyay 1963).). On the west side high temperature impacts are augmented by the afternoon radiation effects. In all latitudes the north side receives only a small amount of radiation, and this comes mainly in the summer. But in low latitudes the north side receives in summer nearly twice the impact of the south side. The amount of radiation received on a horizontal roof surface in summertime exceeds all other sides. The roof heat - impact demands special attention, as its area is roughly equal to all the wall surfaces of the house added together. It is widely believed that a square building has the best characteristics of preserving the heat in winter and remaining cool in summer. This is based on the fact that a square building combines the largest practical volume with the smallest outside surface. The principle may be valid for older types of buildings where, because of relatively small window openings, the radiation effect is negligible. With large contemporary openings, this concept becomes a fallacy.

Information mentioned in Olgyay's book 'Design with Climate', stresses that the effects of thermal forces may be expressed in architectural terms, and that the form of buildings varies with the region. In the cool zone, the low winter temperature overrules the sun's effort to elongate the structure in the east -

west direction, and presses it into a nearly square shape. In large houses the cubical form can be enhanced by a two-storey structure. In the temperate region, where the temperature range permits more flexible plans to materialise, an elongated form is desirable. The thermal stresses, even on wings extending in a north-south direction, impose less penalty than in the other zones. Therefore this region can afford cross-shape or free-form buildings; however, an east-west elongation is definitely desirable.

In the hot-arid region under winter conditions the house could have an elongated form, but it is returned to a squarish shape by strong summer stresses. However, by cutting out part of the cube and filling the hole with shade (walls, trees, trellis) and with cooled air (evaporative cooling, lawn, trees, pool, fountain effect) the environment is changed for the better (micro-climate). Around such a gardenette the plan can be free (the ancient peristilium or the old patio type). Accordingly, the basic plan changes here to an inward-looking scheme.

In the southern hot-humid region the sun attacks the east and west ends of a house and forces it into a slender elongated structure. The temperatures are not excessive, and such a shape can be used beneficially for wind effects (counteraction of vapour-pressure). Free plans can also be evolved here, as long as the house is under protective shade.

Generally, it could be noticed that in traditional architecture, the form of dwellings have been adjusted to take advantage of the beneficial aspects of the climate, and to reduce the impact of unfavourable aspects. The form, layout, orientation and scale of dwellings and dwelling-groups have been controlled in relation to the needs of climatic zone.

Another important aspect of building form is the depth or the distance between opposing facades. We may have noticed that where good internal air flow was required, dwellings should be shallow with single banked rooms, so that each room has openings on two facades. Also important was the spacing among dwellings. The proportions of the space between buildings exhibited the quantity and quality of light falling onto the facades, as well as the availability of breeze, with wider spaces permitting increased illumination and better air movement. It affects the amount of sun falling on the facades.

One of the features traditionally associated with housing in hot climates is high ceilings. This was because heated ceilings would transmit less radiation to the occupants than lower ones, and the convected heat transfer would have less effect with higher ceilings, since the heated air would form a layer under the ceiling, and also because rooms with high ceilings would have larger surface areas and would increase the volume of air within the room. Ventilation rates can therefore be reduced when outdoor temperatures are high.

The effects of rain and wind on dwellings vary from zone to zone and many arrangements have been made to meet the requirements of either protection against wind when it is not required or to catch the wind when it is needed. Builders of the past have used protective measures against the troublesome effects of wind, and arrangements took advantage of its benefits. In windswept places the least exposure is the general rule, and sheltered locations are sought. Huddling for protection is the motivation for the closeness of the towns in some mountainous areas. The weather sides are often specially protected. In hot climate zones ventilation has particular importance as a remedy against

high temperatures and humidities. Town layouts on the African shore of the Mediterranean show street arrangements which bring the coolness of the sea breezes into the heart of the city. Traditional houses in Iraq orient large openings in the direction of beneficial air movements. In Spain and India the use of light latticework lets the slightest breeze bring refreshment into the structure and performs much the same function as the porches of the West. The close-packed Egyptian and Iraqi house uses roof ventilators to catch air currents. In warm, humid climates, for example, wind from the west may still be deflected through windows facing north and south, by staggering the building form or using suitably placed external walls to create high and low pressure zones to induce cross ventilation. On the other hand, in hot, dry climates, isolated high rise buildings are totally unsuitable as they are highly exposed to solar radiation and hot dusty winds, and do not provide sheltered outdoor spaces for the occupants. There are, hence, enormous examples which show different means of benefiting from or avoiding air movements that have been considered as major features of building form specific to each climatic zone.

5) SHADING ARRANGEMENTS

The impact of solar radiation on buildings specially in hot areas has been reduced not only by orientation and effective design of the structure, but also by adequate shading. Walls lend themselves in many ways which can be invaluable for eliminating or reducing one of the greatest sources of heat gain: the solar radiation entering through windows. In these climatic areas, people are used to spending a great deal of time outdoors, hence the creation of comfortable conditions around and between

buildings has been extremely important. Buildings are normally grouped close together to give some shade to each other and to provide shady narrow streets and small spaces between. The tendency in these areas is to make use of arcades, colonnades, and small enclosed courtyards; even larger public open spaces are enclosed, inward-looking and shaded for most of the day.

Shade is equally important in the warm-wet zones, but in this case it must be combined with protection from the frequent and often intensive rains and at the same time allowing free passage for air movement. But one of the problems in hot climates is to exclude not only radiant heat but also glare and admitting, at the same time, sufficient daylight. Glare arises mainly through sunlight being reflected from the surface of the ground and light coloured walls of other buildings. The traditional way to avoid this has been achieved by keeping windows on external elevations small and few in number, with the larger windows overlooking the shaded internal courtyard. High humidity in the warm-wet regions results in a high proportion of the radiation being diffused so that the sky is the main source of glare. In traditional houses thin external walls of coarsely woven mats, which can in some cases be rolled up, allow full advantages to be taken of every breeze and admit a good quality of light while completely eliminating glare and providing privacy. Verandas were used in some areas to provide sitting and sleeping space in an intermediate zone, between indoors and outdoors, even in rainy weather. They shaded the walls and windows and offered protection from glare as well as allowing continuing ventilation during violent storms.

Besides the adapting of building form and structure to the reduction of solar radiation and glare, two other means have

developed and affected building character in relation to shade. These were shading devices and the use of trees and vegetation. The old custom of planting trees by the house has deeper roots than a desire for the enjoyment of nature's esthetic variety (Olgyay 1963). Besides providing protection, trees also contribute much to the immediate physical environment. They reduce air-borne sounds with great efficiency. Vegetation can also secure visual privacy and reduce annoying glare effects. But the main effect of trees is their thermal performance. In winter, evergreen windbreaks reduce heat loss from buildings and discourage drifting snow. In summer, the surface of grass and leaves absorbs radiation and their evaporation processes can cool air temperature. Above all, they provide generous shade in the right seasons. Both deciduous and vines constitute another of nature's automatic heat-control devices, cooling by evaporation and providing shade. This combination makes them valuable for sunny walls in hot weather. Shade is provided, in addition to various structural arrangements, by shading devices such as horizontal and vertical louvers, canopies, hangovers, screens and the like.

6) VENTILATION AND WINDFLOW PATTERNS

Natural ventilation and air movement perform three separate functions: 1) the supply of fresh air for health; 2) the cooling of the interior by convection; and 3) the cooling of the inhabitants under certain circumstances. The forces producing natural ventilation in buildings result from air changes caused by differences in temperature - the so-called 'stack-effect' - where warmer and lighter indoor air is displaced by cooler and denser outdoor air, and by air movement or flow produced by pressure differences. Where these factors are not sufficient to create the appreciable air movements in some hot zones, the

only natural force is then the dynamic effect of winds. Indoor air flow is effected by 1) orientation: when windows are positioned at certain angles to the wind direction, the average indoor air velocity is increased and a better distribution of indoor air movement is provided; 2) while some other features such as vegetation and trees affect air movement within certain positions and sizes; 3) cross ventilation: the larger the windows, the higher will be the indoor air speeds. Accordingly this has effected sizes and position, within building of windows and openings exhibited among different zones. But it is also known that movement of air from outside to inside a building may be both desirable and undesirable, depending on its temperature in relation to the interior temperature. Generally, each zone maintains its own arrangement aiming at the achievement of appropriate air movement within the dwelling. In a warm climate, provision for air movement has been a major consideration in deciding on the layout of groups or clusters of buildings.

Besides the important role of openings in relation to the visual environment, they have a major effect on the internal thermal environment equal to their functioning in relation to sun and light. Windows usually contain adjustable elements and are composed of a number of different layers for different functions. In a temperate climate windows are fully glazed and partially openable. But in a warm humid climate they might be partially glazed and fully openable, possibly insulated louvers being used for part of the opening. In hot dry climates, fully openable and fully glazed openings are the rule.

Generally there are enormous climatic considerations that control size, orientation location and shape of windows and openings. These considerations vary from the need for shutters,

mosquito screening, overhangs and forms of protection from sun and rain, and finally even the provision of security bars is related to the climatic conditions, when they need to be open at night for ventilation.

But the major role of opening has always been the adjustability of a building to reach the comfort condition through their various designs which affect solar radiation and ventilation. When solar radiation causes discomfort, openings can be protected to prevent the penetration of direct solar radiation at times when temperatures are within or above the comfort zone. When temperatures are below the comfort zone solar radiation can be beneficial as it can raise internal temperatures to create comfortable conditions.

One of the principal functions of a window is to provide natural light. In hot climates, or at least during the hot seasons, direct sunlight should be excluded. Lighting in these cases is provided either by reflected sunlight or by light from an overcast sky. In cool and cold climates, the main criteria for natural lighting is to ensure that there is sufficient light on heavily overcast days when sky brightness is low. In hot climates it is necessary to prevent excessive light from entering when the sky is bright, or when reflected sunlight from the ground is intense.

7) ROOFS

Roofs of dwellings modify the internal temperature, and when appropriate properties are chosen it will be possible to achieve and maintain comfortable internal temperatures over a wide range of external conditions. In this, three factors are working concerning the thermal properties of the roof materials. 1) Air-to-air transmission: the quality which represents the rate at which

heat is transmitted from the air on one side of a wall or roof to the air at the other side. 2) The solar heat flow factor: this is the proportion of incident solar radiation which is transmitted through a wall or roof when the air temperature on both sides of the element is the same. 3) The time lag or time delay. This is the difference in time between temperature increases or decreases on the external surface, and the consequent temperature changes on the internal surface, when the element is subject to diurnal fluctuations in temperature. 4) The admittance: this is the ability of the surface of a building element to absorb or transmit heat to or from the air at a given rate when the temperature of the air adjacent to the surface is raised or lowered. The thermal requirements of the roofs are varied according to each region's hot dry climates with a high diurnal range, low humidity, and temperature fluctuating from above. Roofs with high thermal capacity and adequate resistance reduce the external range so that the temperature variation at the internal surface is only moderate. Warm humid climates have a low diurnal range, high humidity, and temperatures within and above the comfort range. Air movement is essential, hence light and reflective roofs are used. They reduce solar heat gain during the day and avoid the storage of heat which would increase discomfort at night. In cold climates thermal insulation is needed for roofing to ensure thermal comfort, economy of fuel, and the avoidance of dampness. Impact of climatic changes within composite zones requires changeable arrangements in roof and wall conditions as well.

In addition to the thermal performance, roofs must satisfy additional climatic criteria. Rain falls in practically all regions of the world; they have been designed to withstand rain. Several considerations are regarded which affect the choice of

roof materials, shape and structure. Generally the amount of rainfall associated with storm, dust, and temperature were the main factors in deciding roof type in many areas. In hot dry climates, the desirable thermal properties for a roof encourage the use of flat roofs. The outdoor space which is created has many potential and traditional uses. Since the roof is exposed to the maximum impact of solar radiation, at mid-day it is unsuitable for use as a day time living space during the hot months. There are some activities where strong solar radiation is an advantage, i.e. the drying of clothes, fruit and grain, especially in rural areas. In cooler seasons, the sunlit roof may be the most comfortable outdoor space during the day, and may be used for such outdoor activities as food preparation and children's play. But when internal temperatures are too hot for night comfort, one of the traditional solutions is then sleeping on the roof. At night temperature will drop by about one third of the total diurnal range to the minimum at or before dawn. Roof spaces may also be the most comfortable spaces in the evening after sunset. The use of roofs may be encouraged by the provision of high external walls which provide privacy and protection from hot dusty breezes.

It is evident that the roof is a determining element in the general form and appearance of regional housetypes. There is a marked correlation between zones of the climate map and the locales in which roof types commonly occur. Flat roofs appear in hot zones, vaulted roofs are found in dry areas, and inclined roofs are found in the temperate climates with consistently dry summers. House types with higher roofs are used in the wet-temperate and cooler territories. In the special case of the dome and vaulted roofs, the rounded form has been attributed to ancient philosophical motives. It has been suggested that it was easy to mold

primitive domes with a branching tree as scaffold, or that the form is convenient where large timbers are scarce. Both domes and vaults, however, are most popular in hot-arid regions with clear skies, where the low humidity leads to intense radiation exchange and creates extreme temperature variations between night and day. The rounded form is also suited to release the nocturnal outgoing radiation and facilitate nightly cooling. This is true in masonry construction, where the heavy building material, through its time lag in conducting heat, secures balanced daily thermal conditions.

8) TOWN MORPHOLOGY

The town layout consists of interwoven synthesis of many factors. Its organism reflects political and social tendencies as much as materialistic and technical requirements. From all these shaping factors which are merged together into a composite picture, it seems difficult to ignore the impact of climate. However, in a town layout the same tendencies and characteristics can be found which were influential in determining single building units. As it is influenced by the same forces, its texture is not only built up as a conglomeration of different shapes, but also reflects man's building tendencies on a larger scale. The density of a city layout varies according to friendly or adverse climatic conditions. In a cool environment the layout tries to provide shelter against the winds. Large building units are closely grouped but spaced to utilise beneficial sun-heat effects. The houses tend to join in order to have less surface exposed to heat losses. The town structure utilises the possibilities of a free arrangement. In the hot-arid zone the walls of the houses and the gardens provide shade to the living areas and to the street, like a horizontal eggcrate device for shading. Unit dwellings are

arranged around closed courtyard-like cooling wells, and are grouped together to achieve defense in volume. Here the town layout reacts against the heat with shaded dense structure. In hot humid areas the buildings are freely elongated, and this freedom is accentuated in the layout. The houses are separated to utilise the air movements; shade trees become important elements; the character of the town fabric becomes scattered and loose.

Human habitation has an integrated correlation with its environment. In its final appearance it seems simple, although it is composite in itself, coordinating countless subordinate actions. The same fundamental laws dominate its characteristics as govern the adaptations of even the small-scale organisms, such as weed structures or cell molecules. No matter how we approach the question through mathematics, physiological considerations, or via the accumulated experiences of tradition - the answer will be the same: where the natural setting is friendly the shapes communicate with the environment and try to merge with it; under adverse influences the form closes its sensitive surfaces and tries to maintain the equilibrium of its own internal life.

8.2 BUILDING MATERIALS

The population of early settlements were urged to look for local resources of materials to be used and adapted to construct their initial shelter. In time, further improvement of the dwellings has taught people to apply more modification by adding artistic appearance well fitted to the specific climatic condition and to achieve the requirements of social and individual realms (Rapoport 1969). Rapoport suggests that the availability and choice of materials and construction techniques in an architectural situation will greatly influence and modify the form of the building. In the same way that the building responds to the physical stresses of climate - heat, cold, humidity, radiation and light - it must also respond structurally to the mechanical stresses - gravity, wind, rain and snow. The reason why construction and materials are best regarded as modifying factors is that they associate with the other ecological factors in the elaboration of building form. One of the basic problems of construction in architecture is the spanning of space - the collection of gravitational forces and their transmission to the ground, usually requiring materials having reasonable tensile strength and a reasonable weight - strength ratio. Under primitive conditions, these are limited to organic materials either animal or vegetable in origin. The only addition in the preindustrial vernacular is an occasional small quantity of metal. Where no such materials are available, or are difficult to obtain, special forms of construction, e.g. beehive vaults and domes, true vaults and domes, have been developed. The primitive milieu is characterised by a situation of scarcity of materials which can be severe.

The Eskimo has only snow and ice, fur and bone, and some driftwood; the Sudanese have mud, reeds, and some palm logs; while the marsh-dwellers of Iraq have only reeds. This scarcity tends to make some solutions impossible and reduces the choice to an extent. Together with the limitations of technology, it has considerable effect on form, since the possible variety is reduced. Constraints make it necessary to provide spaces desired for various human activities by the most direct means. Limited materials and techniques, used to their ultimate, must be used to define place. Typically, under such conditions, builders work up to the technological limits at their disposal. Builders are able to conserve their materials because they have detailed and precise knowledge of the behaviour and characteristics of materials, not just in terms of climatic response and how the materials and building fabric will stand up to the ravages of time and weather. This understanding tends to lead to clear, straightforward solutions to the problems posed by gravity and weathering. Since the objective of construction is the enclosing of space, essential in the making of usable places, the problem is basically one of spanning space while limiting the mass of the combination with the limitations means that the way in which space is bridged affects form considerably.

It has been suggested that vernacular builders always use materials most conveniently available and hence the nature of local materials determines building form. Although the same materials may produce very different forms, it has to be considered that building form is not a production of materials solely, but also of the other ecological factors which when differing, produce alteration in form and construction techniques. There are, however, many instances where choice of materials is determined by the tendency

to use permanent solid materials, such as stone or brick, for cult buildings, while houses are built of more perishable materials. Some materials which involve a great deal of effort or labour may be prestigious and hence favoured by rulers.

In Chapter 10 there will be more demonstration on the role of building materials in setting the architectural aesthetic. It will be suggested that what concerns us in building materials is their schematic values; an inherited knowledge of their properties and behaviours which usually traditional builders employ to affect people with high responses to their built environment.

8.3 LAND

Topography of the site of settlement shaped its development in three ways. First, it represented an ongoing geomorphological system subjected to change through weathering. Second, it included a slope or plane that set construction constraints on buildings. And third, it represented an indigenous site potential. The topography of a site is the result of both geological processes which affected the site: its formation, landform, type of rock beneath the surface; and various weathering processes of erosion and deposition. Many indigenous landforms have been strong design elements. Each site has a unique topographical form and an identifiable character to which the building form has responded.

Topography dictates the basic spatial relationship between the buildings as well as the various activities when taking full advantage of the natural features of site. Examples of this are enormous, and show the importance of site by the care with which land is treated and both buildings and cities are organised. Although we do not deny the role of culture and religion on site selection, it is quite clear that this role is of secondary importance. We ought to remember that in most cases such selection depends on a constellation of many ecological considerations whose effects will give the settlement its distinct pattern. With regard to differences in economy, population density and other conditions, areas under similar topographical and climatic conditions exhibit a sense of resemblance, i.e., coast towns, hill towns, etc.

Site, however, is meaningless without the complementary reality of climate; while site gives to a structure its roots in the ground acting as orientator, relating building to landscape

and to other settlements. Climate acts as a collateral form-giver. It influences the rhythm of mass and perforation. "The simplest and the most sophisticated designs exert their esthetic influence on the environment through the balance of wall-enclosure and wall-opening" (S. Moholy-Nagy 1957). The placing of openings in the solid mass is determined by interior function but it is qualified by site, climate and an innate sense of proportion, which act as modifying influences on frequency, size and orientation.

On the other hand, both building form and settlement pattern are frequently suggested to be affected by the nature of the land form as a generator of building form. As an example, the extended nature of a plain may suggest a sprawling form or by contrast a clustered development reinforcing the sense of place, while valleys tend to generate linear grouping of built form or clusters on ridges and hilltops. Buildings may be designed to look like local landforms or may even be incorporated into the landforms. Thus, building forms may repeat surrounding forms - such as a building stepping down a hillside, its roof pitch matching the slope, or may add contrast such as a tower in a predominantly flat landscape.

Interrelated with form are other characteristics which can be manipulated to influence the relationship of built form to landform. They include geometry, articulation of solid and void, texture, scale, materials and colour.

Historically, the choice of site depended on both topographical and socio-economic factors (Aston & Bond, 1976), as shown by the frequency with which early settlements grew up at river-crossings, around sheltered harbours, or on defensible hilltops. Architectural forms reflected the site, local climate, materials and needs. In this way, landform was one of the primary influences on the developing townscape. A locally accepted use of materials, shape,

scale and colour gave unity and coherence to otherwise piecemeal developments. Examples of very early cultures taking advantage of natural landforms are the Acropolis in Athens, still a powerful and evocative structure, and the Peruvian fastness of Machu Picchu. In some cases - such as the medieval and early Renaissance Italian hill town - the existing landform was exploited to erect even more dramatic built forms. The medieval walled town of Gubbio utilises the steep hillside to which it clings to create a public square, Piazza della Signoria which is slung high above the town between two major public buildings; the Ducal Palace and the Consul's Palace. There is, however, symbolic significance in the choice of site, and later builders continued to maximise the natural advantages of their sites (A. Galloway, 1984). Important also are the views of and from the site. Views of self-contained compositions are easier to preserve than glimpses of distant views. Linked with the views towards the site is the impact of the building on the skyline which is assessed from different points. There appear to be, however, certain ways in which built form can be affected by landform. According to some approaches or views (Norberg-Schulz, 1980), these are:

- A) Complementing: when building elements reflect and harmonise with the landform. The relationship of land and building is enhanced by strong visual links at the ground line; perhaps emphasis of horizontality or use of planting to help merge while the skyline remains undisturbed.
- B) Exploiting: Here the built form adapts and enhances aspects of the landform, increasing the natural drama of the setting. The groundline may be indistinct, so that it is not clear where building ends and land begins, or slightly exaggerated to emphasise

the relationship, for example by use of a bridge or monumental flight of steps.

C) **Contrasting:** The approach is used to enliven a bland setting, and is treated sensitively to avoid conflict. The aim is to achieve a balanced contrast of form, of horizontality and verticality, of scale or colour. A building in this kind of relationship with landform punctuates the skyline but does not disrupt it. At the groundline, there are many possible relationships. The structure may be strongly linked with the ground to heighten the surprise at other levels, or may be divorced from the ground.

However, in all these cases, the elements which influence the visual relationship of landform and building form are numerous. The three-dimensional aspects include form, mass and articulation, geometry and the associated attributes of scale and proportion. Also important are the colour and texture of building materials and plantings and the way in which these are detailed (A. Galloway, 1984).

8.3.1 Soil

The basic composition of soil is a combination of weathered rock and plant remains. The type of soil strongly influences the location, form, and structure of human settlement but does not dictate it. Soil structure qualities limit development potential only until the economic demand for dense use development is sufficient to permit extensive investment in foundations of the soil. In brief, soil has importance for several reasons. Ecologically, as a medium for the support of plant life, architecturally, as a medium for the support of structures and also as an indigenous site potential (J. Snyder & A. Catanese, 1979).

The important soil attributes for plant life are drainage, organic content, etc. Suitability for development is based on stability, drainage as load-bearing capacity. In this context, for example, gravel soils are generally well drained, stable and capable of bearing heavy loads, while silt becomes unstable when wet, heaves when frozen and has limited bearing capacity. As a fundamental site amenity, earth and rock symbolise the relationship of people to the natural environment. Rock outcrops and other topographic features that are indigenous to the site may be used to impart this relationship of continuity and harmony.

8.3.2 Water

Water is important as a base element in the support of all life forms. Surface and subsurface water affect the development potential of the site and can be an indigenous site amenity. The source of most subsurface water is rain and snow. After runoff, evaporation, and transpiration, the remaining water infiltrates the soil. Some of this water collects in the root hairs of plants and around soil particles as soil moisture. The rest percolates through openings in the soil rock until it reaches a zone where all voids are completely filled with water; this is called "water table" and the water in this zone is called ground water. This is important for sustaining water supply and vegetation. It provides the base supply for surface rivers and streams in periods of drought. It also provides water supply for human settlements. Yet development has been depleting this resource, both by tapping it with wells and by building impervious structures that create higher rates of runoff and do not allow water to percolate into the soil. Ground water also has important impact

on the development potential of the site. Areas where the table is high are not only sensitive but also present structural problems. Often, surface water is used as a major site amenity. It is a natural and flexible element and can take a variety of forms to create a variety of effects: repose, reflection, activity and the like. Running water from fountains, streams and waterfalls can create sound and movement as part of a site. Also important is the fact that manipulation of water has produced a variety of building effects. This includes the choice of materials to stand water effects, the arrangement of the community shape to correspond to water bodies and also the organisation of opening and orientation of building to achieve better use of viewing. Drainage of water can be traced through small building characteristics exhibited in the vast number of traditional and medieval towns. Also important is the orientation towards water which affects the settlement shape when water becomes a major supply resource for human and agricultural use (J. Snyder & A. Catanese, 1979).

8.3.3 Vegetation

As an ecosystem, vegetation is considered as an interdependent association which varies with the climate, region and soil type. It is also a major indigenous site potential. Plants are a primary landscaping material; the variety of scale, texture, colour, and shape, together with seasonal change, make them an ideal material for defining exterior space. Trees are used to create a vertical plane for enclosure, to screen objectionable views, to create privacy and to protect the climate of the space.

8.4 DEFENCE

The physical arrangements used to achieve defence varied not in terms of the war and weapon techniques, but also on a scale of defence, i.e., town defence and dwelling security. As war techniques have been developing continuously, these arrangements took many shapes. In the present time it is quite difficult to assume that defence of such a type may affect building or a settlement's physical structure. Only in very particular cases consideration should be given for the achievement of safety appropriate to the highly technical weapons of the present time.

Generally, whether to achieve communal or individual security, defence has been gained mainly through either exploitation of naturally protected sites or by architectural structures or walls (See FIGURES 14, 15, 16). In both cases settlement and building articulation and form have been considerably affected. One other source of danger may come from natural hazards such as flood, forest fire, volcano, etc. The arrangements for protection are taken on different scales. They will enable the settlement inhabitants to flee these dangers rather than protecting the buildings, except for flood in which case the whole settlement is either elevated or protected by dams or walls. However, defence has played an important role in affecting buildings and settlement morphology and patterns which vary from place to place and time to time.



FIGURE 14 Italian Hilltown; natural choice of defence.



FIGURE 15 The walled city of Jerusalem.

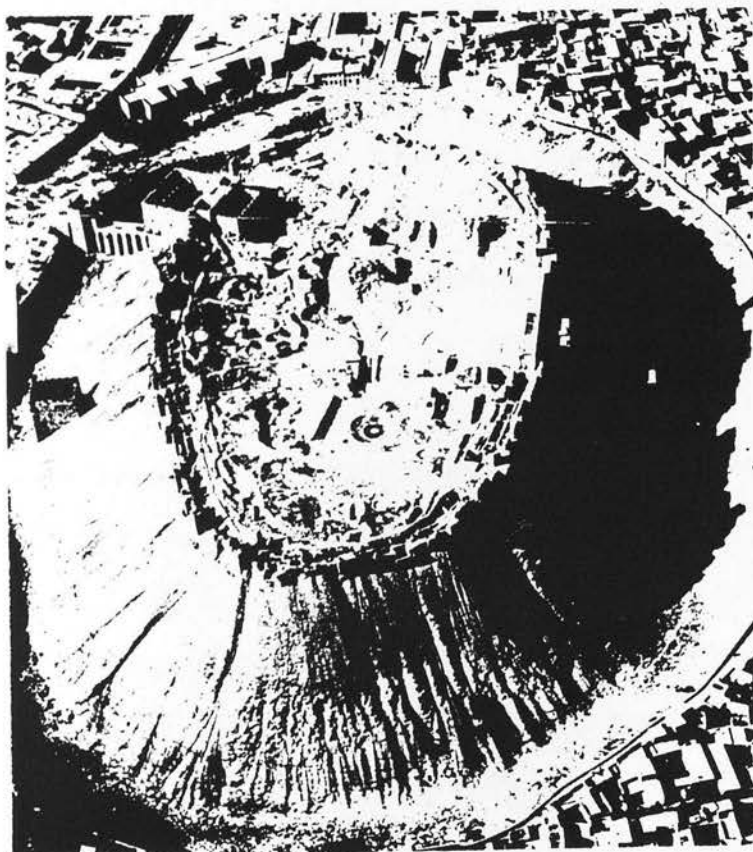


FIGURE 16 Aleppo has the most spectacular citadel built on a partly artificial mound.

A D A P T A T I O N A N D N A T U R A L P R O C E S S E S

9.1 INTRODUCTION

The problem of human adaptation is presented as a dialectic between permanency and change (R. Dubos 1965). To a surprising extent, modern man has retained unaltered the bodily constitution, physiological responses, and emotional drives which he has inherited from his Paleolithic ancestors. Yet, Dubos argues, he lives in a mechanised, air-conditioned, and regimented world radically different from the one in which he evolved. Thus the persistence of ancient traits does not mean that human history is a mere extension of the past, nor do changes in the way of life imply a loss of biological heritage.

The response that a particular person makes to a given situation is conditioned by his past; his evolutionary and experiential backgrounds (schemata) sharply limit the range of conditions within which his responses can be successful. But experience shows that human beings are not passive components in an adaptive system. Their responses commonly manifest themselves as acts of personal creation. Each individual person tries to achieve some self-selection, even while he is responding to stimuli and adapting to them.

Human life is thus the outcome of the interplay between three separate classes of determination (R. Dubos 1965). These are: the lasting and universal characteristics of man's nature, which are inscribed in his flesh, blood and bones; the transient conditions which man encounters at a given moment; and man's ability to choose between alternatives and to decide upon a course of action.

9.2 ADAPTATION

It is remarkable that so many different kinds of populations can survive hardships and shortages which appear almost incompatible with human life. Most primitive people have developed complex social structures and original artistic skills; they have imagined poetical legends to account for creation and have composed romantic songs to celebrate springtime and romantic love. Thus primitive people demonstrate that mankind can survive, retain endearing traits, and create independent and viable cultures without technology, even under the harshest circumstances. However, living organisms never submit passively to the impact of environmental forces; however primitive they may be, they all attempt to respond adaptively to those forces, each in its own manner. Claude Bernard stated that survival and health depend upon the ability of the organism to maintain its internal environment in an approximately constant state, in spite of the endless and often extreme variations of the external environment. Walter B. Cannon enlarged this concept by emphasising the importance of the regulatory systems which enable the body to make useful responses to environmental stimuli. On the other hand, the responses to environmental changes made by each individual organism must be such that ideally they help it to function adequately under changed conditions. The very continued existence of a biological system implies that it possesses mechanisms which enable it to maintain its identity, despite the endless pressure of external forces and is yet able to respond adaptively to these factors. But this is only a concept of the ideal. Living things do not always return exactly to their original state after responding to a stimulus. Describing the "wisdom of the body" Cannon stated that it is not so much the maintenance of an absolute

constancy of the internal environment as the selection for each particular case of one kind of response out of several alternatives available to the organism. Not only does the response often fail to return the internal environment to its original state, in many cases the response is not even appropriate for the welfare of the organism.

Adaptation is treacherous because it can mean so many different things to different persons. The layman, the biologist, the physician, and the sociologist use the word, each in his own way, to denote a multiplicity of genetic, physiologic, psychic and social phenomena, completely unrelated in their fundamental mechanisms. For the general biologist, the only measure of adaptive fitness to a particular environment is the extent to which the organisms of the species under consideration can occupy this environment, make effective use of its resources, and therefore multiply abundantly in it. These criteria are obviously inadequate when applied to man. Many human populations which are at present increasing in numbers most rapidly are precisely the ones whose conditions of life are considered the least desirable, even by their own standards. It is tempting to believe that the problem of adaptive fitness in the case of man can be restated simply by supplementing the classical biological criteria with new social and cultural criteria. Social and cultural forces have become of increasing importance in man's evolution because they determine in a large measure the goals toward which he is moving. In other words, sociocultural forces are now more powerful than biological ones in orienting the evolution of his ways of life. But it is in fact probably impossible to DEFINE ADAPTATION IN SUCH TERMS AS SUBJECTIVE AS SOCIAL STRIVINGS, WAYS OF LIFE, AND CULTURAL GOALS. A type of human being who would find comfort and happiness

in a certain social environment might be ill suited to another society. Even physical attractiveness would prove to be a poor characteristic for defining adaptive fitness in social terms. Aesthetic criteria differ from one place to another, and furthermore they vary with time.

Physiologists have their own meanings which differ from one to another. They argue that all adaptive changes have, of course, a genetic basis, but there are many phenotypic adaptations that are long lasting and yet do not involve modifications of the genoplasm. The organism responds adaptively to many kinds of stimuli by behaviour patterns designed to abolish or neutralise the stressed stimulus, or to withdraw from it. The higher the organism is in the evolutionary scale, the more numerous and varied are the types of responses at its disposal, and the greater is its ability for selecting limited aspects of the environment to which it responds. The most evolved types of responses are the processes of social adaptations, through which the individual organism and the group modify either their environment or their habits, or both, in order to achieve a way of life better suited to their needs and tastes (R. Dubos 1965).

The layman is naturally unconcerned with the diverse concepts that biologists, sociologists, and physicians associate with the word adaptation. For him adaptation means the ability to function effectively, happily, and as long as possible, in a particular environment. However the word's meaning changes with the conditions of its use.

Literature on adaptation has, in general, varied among different schools of thought. From the theory of evolution, we know that species become adapted to their environments by a process of natural selection. This adaptation goes on within species as

local populations adjust to local conditions. "Most organisms cannot survive if they are transplanted outside their observed habitat range" (Charles J. Krebs 1972). But if this applies to plants and animals it might not apply to human beings. This is largely because of human social and cultural adaptive means which enable him to respond adequately to new environments.

Sahlins and Service argue that adaptation, the securing and conserving of control over environment, is the orienting process of the specific evolution of both life and culture. They add that in both the biological and the superorganic realm, the adaptive process has two characteristic aspects: creative and conservative. On one hand there is the evolution of specialised structures and patterns that enable a culture or a population to achieve an adequate measure of adjustment to its environmental setting. On the other hand there is a tendency towards stabilisation, the conservation of the adaptive structures and modes that have been achieved.

9.2.1 Cultural Adaptation

As we have seen, there is a tendency among various types of scientists and thinkers to involve culture whenever talking about human adaptation. It is this quality that makes biological and physiological factors of less importance in the course of adjustments to the environmental setting in human species. Cultural adaptation has also been viewed in different ways. The following is a brief review of the main schools of thought concerning this subject.

First, there is the historical view which considers culture as a closed system consisting of three interrelated subsystems, technical, sociological and ideological (L. White 1945). The

technical component here is the fundamental determinant of the others, and technological development is the impetus for general progress. It might be noticed that culture is taken out of particular and historic contexts. White suggests, without regard to the actual course of development or environmental circumstances, that the general form of the social and the ideological spheres of a culture is determined by its technological attainment.

Second, both Sahlins and Service (prominent authors in the field of cultural evolution) criticise this approach. They argue that the above approach is valid when one is concerned only with general evolution. But when attention shifts to adaptation, to specific evolution, then culture is properly considered as an open system. In specific historic-environmental circumstances culture is an open system entering into relation with nature and with other cultures. THE CHARACTER OF ITS HABITAT will influence a culture's technology, and through technology its social and ideological components. The specific perspective on evolution involves a conception of culture as an open or adaptive system. ADAPTATION EMBRACES BOTH RELATION TO NATURE AND TO OTHER CULTURAL SYSTEMS. Adaptation to nature will shape a culture's technology and derivatively, its social and ideological components. Yet adaptation to other cultures may shape society and ideology which in turn act upon technology and determine its further course. The total result of the adaptive process is the production of an organised cultural whole, an integrated technology, society, and ideology, which copes with the dual selective influences of NATURE on the one hand and the impact of outside cultures on the other. Such are, in general outline, the mechanics of cultural adaptation suggested by the above authors. They also criticise the approach to cultural adaptation presented by the school of

cultural ecology in which culture is understood to be a product of human behaviour in response to mere environmental settings. They put emphasis on the dual nature of culture's environment, the fact that both habitat (environment) and other cultures comprise selective influences. The case in "cultural ecology" is that it tends to ignore intercultural relations. (The concept of cultural ecology has been introduced previously in this study.)

Sahlins and Service argue that "cultural ecology" must embrace the relations between cultures, the superorganic setting, as well as the natural features of habitat, just as "ecology" in biological studies includes the organic environment, and competing species, as well as the inorganic. In this way a major consequence of adaptation for culture as a whole becomes the production of diversity. Culture, differentiating into "cultures by adaptation", has made possible the exploitation of the great variety of the earth's resources. I may argue here that it is difficult to envisage any way in which societies learn by means of acculturation that will enable them to achieve better and diversified exploitation of their own environmental resources as far as these means imply similar consequences on the various levels. One other fact that borrowed technology ignores usually differences in the habitat and subject people of various cultural settings in terms of their ecology, its use, production and social consequences. This is reinforced, maybe, by Sahlin's suggestion that the condition for cultural divergence is the presence of an open and diverse habitat (environment) into which culture can expand. Expansion into a large, diversified area produces extensive variation known as adaptive radiation; ecological divergence on a grand scale. On the other hand, movement into and adaptation to particular environments

in culture, as in life, sometimes results in "simplification", the sacrifice of specialised parts that are vital in other environments. Cultural parasitism and formation of "par-cultures" fall within this class of adaptive phenomena, though in this case simplification results in a loss of self-sufficiency. Divergence through specialisation, adaptive radiation, simplification, and the like is not the only consequence of cultural adaptation.

9.2.1.1 The Stability of Culture

A culture is an integrated organisation of technology, social structure, and philosophy adjusted to the life problems posed by its natural habitat and by nearby and often competing cultures. While adaptation is creative, it is also self-limiting, and leads the culture to a state of stability. A given population may vary through time in absolute numbers; it is considered stable as long as its structure is maintained. Similarly, cultures are structured by their adaptive orientations and requirements. Because of new demands, Sahlins argues, specific changes may be required to maintain the structure, and in addition traits may enter or leave the system with no consequent alteration of structure. The most relevant statement to our study has been Sahlins's, when saying that stabilisation is a process in itself, induced and necessitated by natural environmental factors and that the success of the process is determined by the rate and character of environmental modifications. The principle of stability means that culture tends to persist unchanged, and under the influence of external factors acts to maintain the basic structure through adaptive modification.

9.2.2 Behavioural Adaptation

One characteristic notion of cultural ecology has been the care for the behavioural modes that embrace human cultural adaptation. According to John W. Berry, the term adaptation is an ambiguous one. It refers to the changes in culture or behaviour which are associated with changes in an environmental setting. If we accept the proposition that culture or behaviour will change as a function of environment changes, we cannot accurately predict either kind or the degree of change which will occur. The varieties of change may be termed as adjustment, reaction, and withdrawal. In the case of adjustment, behavioural changes are in a direction which reduces conflict, hence, increases the congruence between the environment and the behaviour by bringing behaviour into harmony with the environment. This variety is most often intended by the term adaptation. In the case of reaction, behavioural changes are in a direction which retaliates against the environment; these may lead to environmental changes which, in effect, increase the congruence between the two, but not by way of cultural or behavioural adjustment. In the case of withdrawal, behaviour is in a direction which reduces the pressure from the environment; in other words, it is a removal from the adaptive arena. The third mode is often not a real possibility. For the second mode (reaction), many traditional societies cannot successfully engage in retaliatory responses. . Thus for most people, the adjustment mode of adaptation is the only realistic response. Behaviour, then, has to be viewed both as a function of a set of cultural factors which are in adaptation to an environmental setting, and as a function of direct (culturally unmediated) stimulation impinging from that same environment (J. Berry 1976).

9.3 ADAPTATION AND NATURAL PROCESSES

"The law of adaptation is the fundamental law of nature in all structure" (Greenough 1947). Greenough suggested that the variety of forms in nature might seem capricious to the casual observer. They might seem to be evidence of omnipotence at play for mere variety's sake. In fact, every detail of organic form, he argues, has its functional purpose. By a study of this principle of adaptation in nature, the architect may arrive at sound principles in building (See Article 2.5). It has also been suggested that in nature forms are the outcome of environment. Environment determines function, and forms are the result of function (L. Eidlitz 1881). Building forms must be adapted in an equivalent way to the environment in which they are situated until the functions resulting from the environment are fully expressed in the architectural organism. Of course there is the important matter of the material and technological environment of the building, which will effect the available materials from which it may be constructed, as well as the tools and manufacturing processes which can be used to make it. There is little need to elaborate on the way in which different materials of construction and techniques of manufacture can have their effects on the resulting forms of buildings or any other useful object.

There are, however, some plausible reasons why artefacts or buildings of related function might have a similar form or appearance. One reason is this constraint which the local circumstances of materials, manufacture and function impose on form. Under equivalent conditions, the resulting forms might be expected to be comparable. Another reason for similarities of form is a genetic one: that one object has been copied in its manufacture from another of similar function - the builder or designer has taken

another building, or an image of a building in his memory, as his model in producing the new one. Therefore, forms and styles of artefacts and buildings are to be related to environmental conditions occurring at different points in time. If the environment changes between one period and another, so would the forms and styles. One may argue that, should the environmental conditions change back to what they were precisely at some previous point in time, then in principle so should the forms of artefacts and buildings revert exactly (P. Steadman 1979). As the similarity of form is to be attributed to the fact of copying, then this immediately implies a process extending over time as designs are copied and copied again.

One must imagine, however, that for various reasons - lack of skill on the part of the maker, the resistant nature of materials and so on - these copies are not exact in every detail, and that slight variations of form creep in as a result. These correspond to the variations between individuals which play a crucial role. When various buildings or tools are put into use, they are subjected to a variety of tests, of their strength, impermeability to water, whatever characteristics there are which confer appropriateness or fitness on that building or object for its particular function. Large numbers of the same design are made, and those designs which have slight variations in form which confer a particular advantage, an increased fitness, will tend to be preserved or selected. They will either tend to survive longer or perhaps they will be preferred as models when it comes to copying their forms in new buildings or tools (Ibid.).

One may notice that it is not necessary that all variations in form between copies should be beneficial or constitute an improvement. It is possible that variations may be introduced simply accidentally, 'at random'; selection processes will ensure the

spread of the advantageous features, and the elimination of the disadvantageous. Philip Steadman argues that one feature which is necessary is that there should be long periods of time over which the evolutionary process can take its course; and that during these periods the environment or function should not be subject to any extremely rapid changes. That is, it takes time for selection to act. If large changes or variations were made at once, or many changes made at one time, then the whole coherence and hence the viability of the organism or the functioning of the building would be jeopardised.

The analogy from organic evolution (as illustrated by Darwin's theory) when applied to human manufactures puts a new interpretation on the kind of relation between an individual artefact and the general type of which that artefact is but one example. The type is what is transmitted in copying. It is the set of genetic instructions or 'cognitive knowledge' which is somehow passed from one generation of builders and craftsmen to another. Artefacts themselves in some sense serve to carry information about their own function and manufacture, through time. Such cognitive knowledge passes through the neural systems - in simple words, head, - of builders, and there exists in the cognitive structure of the builders in some form the type, or image, or model for a species of artefact, which guides him when he comes to make a new copy. It is not individual buildings or artefacts which evolve but it is abstract designs, developed in the cognitive system of which particular buildings and artefacts are concrete realisations. We, therefore, can talk about an abstract design transmitted culturally through the cognitive structure for a type of building. When it comes to making a particular building, then the design is realised; but it is realised with the available materials, with the tools immediately

to hand and on some specific site with its own specific features. These environmental factors acting on the development of the building will plausibly have their effects in slight changes or variations in form from one building of the given type to another. It is also due to differences in topography, available resources or building materials and so on. The realisations would have all been different in minor detail, though all built to the same underlying design. It is perhaps possible that this idea provides one way of understanding the very characteristic feature, of primitive and vernacular architecture: that within a pattern of overall similarity between one building of given function in one culture or another, there will often be considerable variations of detail (P. Weiss 1955). (Other interpretations in terms of different choices on the part of builders or occupants, small functional differences, are equally possible.)

Darwin showed how similarities due to heredity or historic origin could be connected with similarities due to adaptation to similar environmental conditions. According to Darwin, adaptation to environment was produced through trial and error, and the successful results retained and passed on through heredity. But in every case it is not the contributions of individual geniuses alone which are the source of creation and progress; it is the existence of a system in which each generation builds on the achievements of its predecessors, and cognitive knowledge and skill are built up cumulatively. Steadman argued that there is a very general idea that technical progress in building, the accumulation of structural, material and engineering knowledge and the refinement of constructional form and technique, have been the product of extended historical processes of trial and error by many generations of architects.

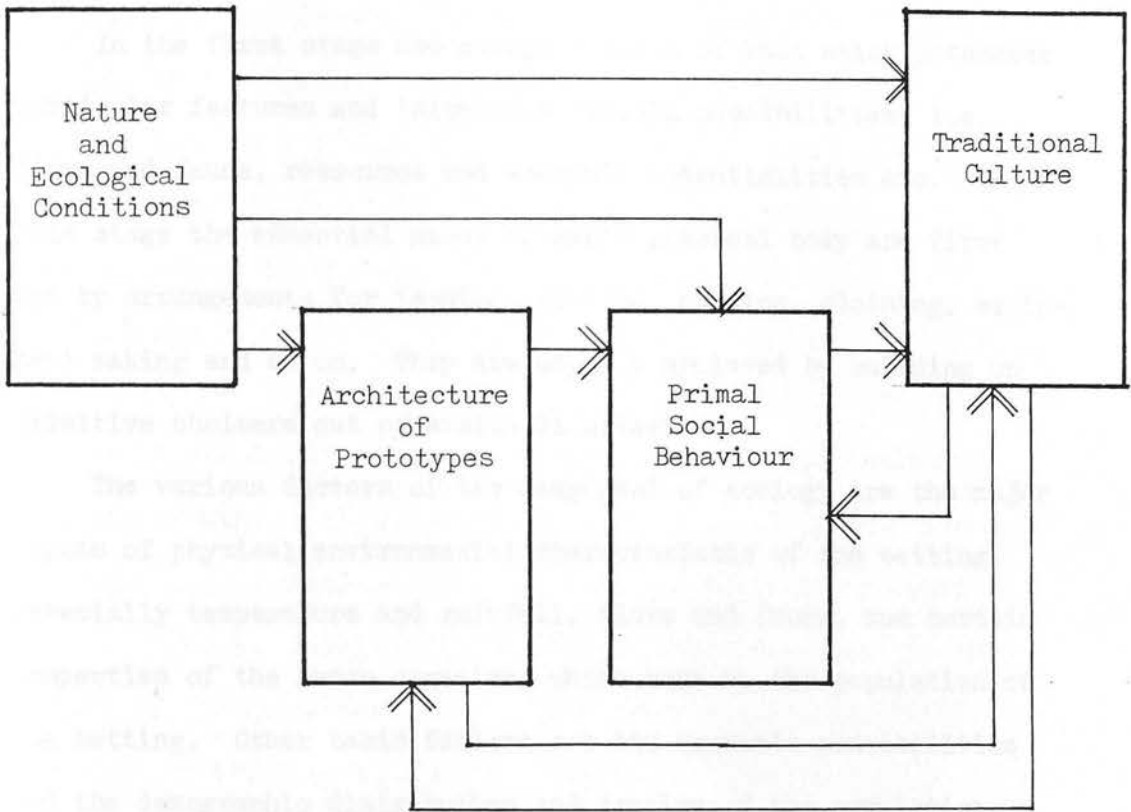
Where better can this be observed than in medieval architecture? The critic, Steadman argued, will find here 'a series of buildings, one succeeding the other, and the last continuing not only all the improvements before introduced into all the former examples, but contributing something new itself towards perfecting a style' (P. Steadman 1979). When, over a century, the talents, taste and experience of a hundred or even a thousand ordinary men are built into the design, the result will be something that not even an individual of the greatest genius could match (J. Fergusson 1849). But it is important to notice the necessity of a considerable length of time over which the evolutionary process had stretched and made a series of buildings with slight variations before selecting those with somewhat more satisfactory performance.

The question that may arise here is 'do designers of the present time have to emulate these evolutionary processes of vernacular architecture over such elongated periods of time, or could there be an alternative way to achieve similar results'? It seems, at least to me, that we cannot ask this question in the first place. One consequence of the attempt by many architects within the modern movement to emulate the historical or traditional architecture is the production of more distorted and environmentally disrupted designs.

9.4 MODEL

We have examined some basic theoretical notions about ecology, culture and cognition and their implication in architecture. The purpose of this article is to outline a systematic model which structures these variables and considers some relationships among them. Before doing so, it will be useful to briefly examine the nature of the models in relation to theories and hypotheses

cross-culturally. The simplest statement about how these notions relate to each other presents the theory as an abstract formal statement to which are appended rules for manipulating these elements and definitions that relate them to the empirical world (Marx and Hillix 1963). Hypotheses, to them, are specific empirical predictions which may be derived from a theory and whose accuracy may be checked by empirical observation. While theories are based on empirical observations or on rational analysis, models constitute a particular subclass of theory and so may also lead to hypotheses. Theory provides general guidelines while models provide specific guidelines for empirical research. However, models may be classified in a number of ways. One kind describes certain empirical relations, while another kind, the predictive, generates propositions about the nature or existence of empirical phenomena not yet examined or observed by the scientists (S. Rosenberg 1969). Another classification, (A. Rapoport 1963) 'models of social interaction,' distinguishes between descriptive and predictive models. The descriptive model is an empirical description of extant relationships and is employed to gain insight into multiple relationships among sets of data. The predictive model employs some empirical relations and approximates the traditional use of the hypothesis. The model presented here is both descriptive and predictive. For the ecological and cultural variables, it describes extant and known relationships, but for the architectural behavioural variables it predicts the kinds and levels of architectural behaviours which are likely to be found in different ecological and cultural settings. The best way to introduce the model is to present it graphically and describe it verbally, in terms of its major overall components and relationships.



It should be noticed that this model differs from the other models (e.g. see Berry 1976 and Altman 1980) in the emphasis it puts on the role of built environment, and in particular the prototypical stage it plays in molding and affecting the cultural context. Although cultural and social behavioural variables are considered to be in a process of adapting to ecology, they are also affected by the primal physical structure of the settlement in any setting. It should also be emphasised that the relationship between the different variables of the model are probabalistic, not deterministic, and correspond to the school of cultural ecology already presented in a previous section of this study. However, in more extreme ecological settings, these relationships may be stronger due to environmental limitations on the cultural and behavioural forms which may emerge.

9.4.1 Component of Ecology

In the first stage men occupy a piece of land which possesses particular features and introduces certain possibilities, i.e. flora and fauna, resources and economic potentialities etc. In this stage the essential needs of man's physical body are first met by arrangements for feeding, heating, housing, clothing, equipment making and so on. They are usually achieved by building up primitive shelters out of available materials.

The various factors of the component of ecology are the major inputs of physical environmental characteristic of the setting, especially temperature and rainfall, flora and fauna, and certain properties of the human organisms which make up the population of the setting. Other basic factors are the economic possibilities and the demographic distribution and density of the population.

9.4.2 Component of Prototypical Architecture

From the beginning man has created and developed some forms out of the available materials to meet his various needs, and which are found to be the optimal outcome of various properties of these materials. These forms and elements were transferred from one generation to the other through the movement of knowledge. These distinctive prototypical forms and elements were valid until drastic change was brought about by industrialisation and the manufacture of new techniques in building.

In the first stage of human adaptation to environment, provision is made for protection against animals and against physical dangers. The settlement pattern is shaped by orientation to basic economic resources of nature and also by arrangement to embody various relevant activities. All the primary problems of human beings

are solved for the individual by artifacts, organisation of co-operative groups and adaptive behaviours to meet the communal interest within specific vernacular tradition.

The refined building arrangements and form types are copied from old (prototypical) models which were evolved in accord with the prevailing circumstances of ecology (See Chapters 7 and 8). The builders or designers made every effort to ensure the exact function and performance of those traditional prototypical forms, even when adding little improvements or changes from their own imaginative skill. This copying is usually found in primitive and vernacular societies. There is in such societies a great measure of social stability and a considerable conservatism in the methods of the craftsmen; stabilities which are further reinforced by tradition (P. Steadman 1979). Steadman's idea is that the study of the history of the development of tools or of building types was valuable in so far as it could reveal principles or methods which might then be applied in modern practices. He attributed the failure of recent architectural and industrial design precisely to the collapse of the vernacular tradition and the disappearance of handicraft methods - phenomena which themselves had been brought about by industrialisation and by rapid changes both in public taste and in the patterns and requirements of domestic and social life.

9.4.2.1 The Cognitive Basis of Architectural Prototypes and/or Patterns

How do we assign meaning or give evaluation to certain visual objects (such as form, building arrangement or element)? It has been suggested that one of the most important aspects of the visual perception of an object is pattern recognition which identifies objects in the visual field (M.W. Eysenck 1976). Eysenck suggested

that what needs to be accounted for is the amazing flexibility of the human perceptual system as it copes with a multitude of different stimuli. An example of this flexibility much favoured is our ability to recognise different visual presentations of the letter 'A' as instances of the pattern 'A' in spite of considerable variations in orientation, in typeface, in size, and in writing style. I shall argue that basically this idea is applicable in the field of built environment. We have the ability to recognise different visual presentations of the column, for example, as instances of the pattern 'column' in terms of its basic performance, in spite of the variations in size, shape, length, style and materials. It seems clear at a very general level that it involves matching information in one memory store (the sensory register) with information in a second memory store (permanent or semantic memory). In other words, information conveyed by the senses is matched with and related to what we know about the world. In fact, various attempts have been made which explain how this matching process occurs. One simple attempt is presented by the 'template theories'. The idea is that object information is compared directly to various miniature copies (or templates) of previously presented patterns which are stored in permanent memory. Objects, e.g. various kinds of columns, brick walls, etc., are identified on the basis of those templates producing the closest match to the object's input. One difficulty this theory faces, Eysenck believes, is when considering how template theories explain the ease with which patterns are recognised in the face of changes in size, orientation, colour, and so on. It could be argued that there is a separate template for every conceivable instance of a pattern, but this would be uneconomical in storage terms, and thus seems implausible. However, template matching theories tend

to be rather unwieldy and ill-equipped to account for the versatility of perceptual processing. These inadequacies are especially obvious when the object belongs to an ill-defined category, i.e. a category for which no single template could possibly suffice (e.g. a building) (M.W. Eysenck 1979).

Another type of theory, the prototype theory, which is more accounted for, claims that similarities among related objects play an important role in recognition. Prototype theories argue that each stimulus or object is a member of a class of objects, and share key attributes of that class. Recognition involves comparing objects to prototypes, which are abstract forms representing the basic elements of a set of objects. No doubt in architecture those prototypes were evolved or built to achieve the optimal function and conformity with their physical, economic and natural contexts on which various versions of the successive types of objects were based.

One obvious advantage of the prototype theory of recognition is that the information stored in permanent memory consists of a manageable number of prototypes rather than a virtually infinite number of templates. Eysenck introduces an example which gives quite strong evidence in favour of prototype theories as obtained by Franks and Bransford (1971). They started by constructing prototypes; this was done by combining geometric forms such as circles, stars, and triangles into structured groupings. Several distortions of these prototypes were then formed by applying one or more transformations to them. Subjects were then shown some of these distorted patterns (but not the prototypes themselves), followed by a recognition test. The results were quite striking, Eysenck stated. The persons were most confident that they had seen the prototypes, in spite of the fact that the prototypes had not been shown to them before. The simplest explanation is that the subjects

used information from the various patterns presented initially to construct prototypes which were then stored in long-term memory. This prototype knowledge was then used to classify and identify new stimuli, with recognition being simply a function of the extent to which any given pattern matched the stored prototype.

Though formed to serve within their specific area in psychology, knowledge and recognition, the theories of prototypes, can, indeed, be invested in the field of architecture. They provide the clues about how builders and designers of vernacular societies implement inherited knowledge of building arrangements, elements, articulation, etc., which usually evolve in response to images (prototypes) stored in the permanent memory system. It is by actualising these images of architectural elements that a design would tend to be more appropriate, fit and appreciated.

9.4.3 Component of Social Behaviour

While spreading over the earth, mankind has found environments of various characters. In each case the social life falls into patterns partly determined by nature and ecology, and partly and most importantly by the spatial and physical structure of the emerging settlement. According to H. Spencer, he conceived of society as an organism and the institutions and behaviours of society as organs. Social organisations represent adaptations of the collective organism, conferring fitness in the struggle for social survival in the face of natural conditions and in competition with other social groups (H. Spencer 1876). Spencer also argued that social forms and social institutions themselves evolved in response to natural environments - as shaping the thoughts and actions of men and not the other way around. Such ideas, applied in design, would attribute differences

in architectural forms, not to the imaginative or inventive power of individual designers, but to varying social conditions and utilitarian needs. However, we may suggest that the prototypical patterns which include building articulation and dwelling distribution, choices of materials and their consequent types of structural elements, i.e. arches, columns, walls, etc., were major factors which shaped individual behaviour (See FIGURES 17, 18, 19).

It follows that one has to consider the underlying factors when it comes to understanding the nature of social structure, social institution and the social behaviour of a certain group of people occupying a certain setting.

9.4.4 Component of Traditional Culture

Culture is largely a response to an environment. It consists of the devices evolved to meet needs evoked by particular physical conditions, to take advantage of local sources of food and to secure protection against hazards. Different societies have been prompted to invent different devices and to discover how to use different natural substances for food, fuel, shelter and tools. Forest people can develop wood-working, carpenter's tools, log cabins, and carved ornaments; steppe folk must make larger use of bone, basketry and leather, can do without axes and dwell perforce in skin tents or in subterranean shelters (G. Childe 1942). In response to the promptings of its own peculiar environment, each society may be expected to evolve distinct processes and devices. In summary, the traditional cultural component has been argued to be in adaptation to ecological component factors, and in turn influencing social behaviour. Within the culture, socio/cultural context and sociolisation emphases have been viewed as interrelating variables, which are all in adaptive relationship with elements of ecology components.

Within the general framework of our adaptive model, culture of some particular people is viewed, Clarke suggested, as a complex whole. This whole is in a state of continuous dynamic interaction with its environment. The term culture, in this context, is taken to mean the entire combination of social organisation, religious tradition, economic system and material culture, grouped together and regarded as a single grand system (D.L. Clarke 1968). For Clarke, culture acts as a regulator, protecting itself and the individuals within it from the extreme effects of environmental change. Clarke has represented the whole of some given culture as an adaptive system, which responds to the forces impinging on it from the environment ('environment' to include other, neighbouring, cultures, as well as nature) by appropriate changes and reorganisations. These changes serve to maintain the stability and continuity of the culture and to increase its adaptedness for the particular circumstances. Clarke argues that information which is stored in and which passes through the cultural system serves the ultimate purposes of survival; that the sum total of cultural information, much greater than that which any one man could carry, confers 'fitness' on the group. The more efficiently and effectively a cultural system can convey this survival information to the new individuals who carry it on, the better fitted it will be, not only for continued existence, but for growth in numbers, diversification, and for exploiting progressively more difficult and unpromising environments. According to Clarke, "cultural systems are therefore information systems of cumulatively acquired knowledge, partly replacing instinctive behaviour in man, and selectively advantageous in his struggle for survival" (See P. Steadman 1979, and Clarke 1968).

9.4.5 Interaction among Components and the Application of the Model

In summary, we may have noticed that the model meant to avoid determinism and linear or causal relationships. This is accomplished by treating each of the relationships as probabilistic and also feedback relationships are recognised for most of the components, even for the component of ecology. This is because our definition of ecology includes cultural and social variables, as has been demonstrated in Chapter Three. That is, cultural capacities of a society can alter or modify some elements of the ecological setting to the benefit of man within the same structure of culture which is basically in a process of adaptation to the permanent systems of nature in that setting (See also Chapter Four).

It should also be understood that for practical reasons, the model does not tackle the contemporary issues in which some cultures are influenced by a dominant culture, by acculturation or diffusion, which results in the adoption of values exotic to its setting. The aim is basically to introduce a predictive approach in architectural thinking based on adaptive processes that normally characterise authentic solutions of the vernacular traditions.

Examples of mutual interactions among the various components of the model is well illustrated by the components of traditional culture. Although it has been demonstrated that essentially culture is influenced by the social structure of a society as well as by nature and ecology, it has the reverse effect on both components. Culture can influence the social context for example, by promoting new social organisations and social institutions. Although the model introduces a similar situation in which culture and social behaviour influence the components of prototypical pattern, the tendency is to consider such effect rather weak and that it exhibits almost a

unidirectional relationship, i.e. the prototypical patterns can hardly be modified or altered due to cultural or social considerations. These patterns were evolved in response to basic natural, physical and maybe biological needs. Social behaviour may have stronger implications on architectural forms only in successive stages of cultural evolution which the model did not tackle for practical reasons.

One significant application of this model will lead us to our example cited in Chapter One when tackling the issue of identifying a problem. The building arrangements, we said, in an arid country are not evolved in accordance with the social context or social requirements as many believe. On the contrary, according to the model the social context is essentially shaped by people's adaptation to the spatial and physical structure of their settlement which in turn evolved to conform to the prevailing ecological circumstances, especially the climatic. Hence by following the same argument it would be possible to identify the context of any of the components by attributing it to its order within the model and elaborating the design solutions accordingly.



FIGURE 17 The hilltowns of Italy provide physical grounds for distinctive behavioural and social patterns.



FIGURE 18 Bagdad; its compact physical structure underlies and affects people's behaviour and their social interactions.

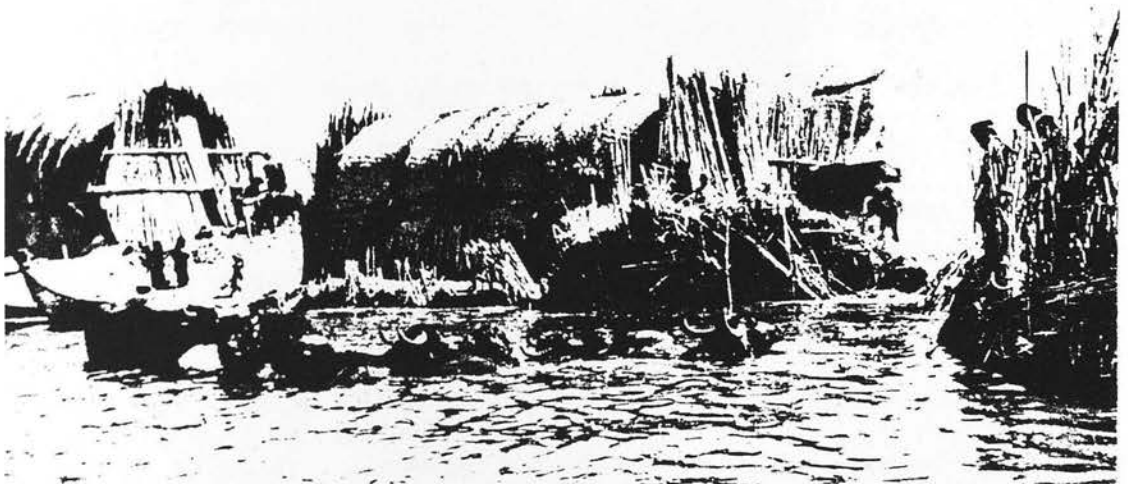


FIGURE 19 Houses of reed on artificial islands led to a very peculiar and cohesive society in the marsh area of southern Iraq.

Chapter Ten

INTRODUCTION

COGNITIVE REPRESENTATION

OF

BUILT ENVIRONMENT

COGNITIVE REPRESENTATION OF BUILT ENVIRONMENT

10.1 INTRODUCTION

It is certain that we are gradually becoming familiar with the quite frequent meaning for the term 'schematic', which refers to the knowledge, embeded in the permanent memory, of objects, events and their essential interrelationships with organisms. It is important here to repeat that such knowledge tends to concentrate on the most natural and innate properties of these objects which are to be considered as permanent and persistent, rather than on properties resulting from man's actions on those objects. In the previous chapters we attempted to introduce this notion of cognitive knowledge, its acquisition, communication and storing processes through man's adaptation to his environment. At a relatively more detailed level we were introduced to the major ecological factors that are thought to build the cognitive knowledge and lead to differentiated human cultures. It was argued that such knowledge is characterised by a basic relationship to a set of prototypical patterns concerning building arrangements as well as other environmental aspects. The intention in this chapter is to approach the problem of 'design' clearly by implementing man's schematic images of these prototypes as these prototypes represent the underlying essence of events, objects, situations and the interrelationships among them within a setting. When talking about schematic images we mean what refers to the natural properties of materials, including their functional, structural or physical, and which contributed to the elaboration of the various architectural and environmental patterns which abound in many vernacular societies. There is a very general idea

that building details including decorative patterns and ornaments form a basic representation of the functional properties of building materials and building techniques. These details occupied the attention of many architects and theorists who saw in them only 'a pure aesthetical' properties which only symbolise man's cultural or social values. In fact when people think about ornaments in building the most likely explanation for them is they were elaborated to enhance the beauty of the building in the first place. And it is this attitude that we argue to be simply wrong for the reasons we are giving both from the history and literature of the subject and also from our own view presented in detail later in the chapter. With variable flexibility, major 'aesthetical characteristics' of many buildings of different historical periods are but 'stylistic' implementation of structurally and functionally determined arrangements. Furthermore, I believe it is true that people over time inherit a knowledge mostly related to these practical arrangements before they come to be aware of how to communicate methods and skills of a building's pure 'functionless' ornaments and decorative patterns.

10.2 FORM AND DETAILS

Roger Scruton declares that "to divorce architecture from practical life, to consider it as something outside all considerations of function, utility and value, is to misrepresent its nature." The sense of detail, decoration and other miniature characteristics is an indispensable component in aesthetic attention. In exploring this sense, Scruton suggests, we shall be approaching the actual workings of architectural understanding, not only in its self-reflective, but also in its primitive, form. (R. Scruton 1979).

There is nothing more meaningless in architecture than a detail used at random, outside the control of any governing function or conception of design. The central theme at which I aim is that architectural decorative characteristics and architectural form are complementary. There is no possibility that architectural form can be achieved disregarding structural and functional details. These details and the 'apparently' decorative elements are the major contribution of the idea of form. Along with this notion is Alberti's suggestion which considered the beauty of a building to reside in a harmony of parts, fitted together with just reflection, in such a way that nothing could be added, diminished or altered but for the worse (L.B. Alberti 1485). Yet it is a disheartening feature of much modern architecture that it lacks this flair for detail. In fact, Scruton says, modern architects have often shown a hostility towards everything that could be conceived under the aspect of 'ornament'.

Along with this, perhaps, comes the distinction between forms imposed and forms discovered. The first category represents a form which lends its idea to a mere abstraction in which nothing of an idea of details can obviously be necessary; the architect, like many composers, creates such form in response to his intention of creating a problem in order to amuse us with its solution (FIGURE 20). Creation in architecture of such problems may seem to always have an artificial air. And yet this is the case with most if not all kinds of buildings of the modern movement. The other kind stems its architectural values from the articulation of its various parts mostly done with human individual skills. Now there is certainly a fundamental difference between our attitude to buildings which bear the imprint of human labour and our attitude to buildings

which do not. The modern buildings whose parts are mostly machine-made are the results, of course, of human intention; it may not be, for all that, the expression of a human act. If these buildings are seen merely as machine-made, then they must appear to some extent alien to us, seeming to derive their values and meanings from a source that we may not identify within the knowledge we store in the permanent cognitive structures of ourselves. The aesthetic endowment of the 'discovered' form, is aiming at a right and proper fitting together of the parts of a building. Each part must be bound to the others in some relation of 'appropriateness' familiar to us because of the practical (experiential) values of these parts. It is a relation which enables us to see the existence of one part's function as providing a reason for the existence of another (See FIGURE 21). We cannot, in any case, approach modern architectural forms with such simplicity as provided by the vernacular forms. Instead, one has to be specifically aware of the philosophical arguments behind the imposed form of a modern building in order to prompt his 'understanding equipment' towards responding to or discovering its aesthetic values. Yet this is far beyond the capability of many of us which makes the experience of 'perceiving' such building a disturbing one. While vernacular building requires no specific education to be discovered, many modern designers have to write 'books' in order to explain the many aesthetic and any other virtuous values of their works.

If we put aside the issue of defining what beauty is, we will arrive in a moment at the point where such a concept is basically experienced whenever there is an appropriate fitting together of the various parts of a building, which is the primary intellectual gesture in any decorative work. If it is important for an architect

to have a style, it is in his employment of this concept to achieve a better effect, as it were, more concretely. Style hence is not the accumulation of details, but it is the improved fitting of these parts. That is, our sense of the 'appropriate' developed through experiencing and recognising multiple choices presented by the various properties of materials and their articulation, and through seeking a potential order among them. This 'appropriate' is of universal application, and it would be wrong to confine it to some specifically 'aesthetic' usage from which its sense derives. The judgement of the appropriate has its origin in our pre-knowledge of objects. It is hence free of any concept and refers to no certain feature of the objects but to our elementary schematic relation with these objects which is best exhibited by fitting together appropriately various parts, materials or the objects as wholes. Now, there might be an ambiguity in confining judgements on buildings' aesthetics to concepts such as proportion, balance, line, symmetry and so on, only if these concepts serve to concentrate on the sense of the appropriateness in the sense we present. The obvious reason behind such a belief is that it is hard to provide an account of, or meaning to, these terms or to our reason for being interested in the qualities which they draw. Simply, then, we understand proportion in a building only when its various parts are judged in terms of their shapes, sizes and structural qualities which exhibit proper fitting together, but not in terms of mathematical rules. It is also possible to consider that concepts such as proportion, verticality, horizontality, symmetry, formal space and so on, have developed to conform with the social and cultural structures of a society. In all cases it is hardly true that our aesthetic judgement of a building is confined to any of these concepts and hence

there would be little significance in tackling them any further in this study.

10.3 FUNCTIONAL ORIGINS OF DECORATIVE FORMS

It will suit the sequence of our argument to examine the basic topic, that is of the evolution of decorative motifs and patterns and miniature characteristics such as those found on pots, weapons, utensils, fabrics or buildings. Here it would seem to us that changes in these were produced in very gradual stages; and that arrangements and motifs were transmitted through a similar process of successive copying with slight modification each time. Many examples from both vernacular and primitive societies demonstrated the apparent conservatism of the designers and their unwillingness to make severe alterations to traditional forms. Therefore the origins of particular decorative forms or architectural features are to be discovered by tracing them back through continuous series of slightly differing copies. Such chains of design might begin and end with examples so widely different that, unless the intermediate links were known, it would not be possible to realise that they were in any way related.

The best study within this context is presented by Henry Balfour. He distinguishes several stages in a general evolutionary sequence (H. Balfour 1893). In the first place, very simple and early ornament is produced by some emphasis on the natural characteristics of the material from which the object is made. In tools carved from wood, for example, it may be that the dominant knots are picked out by colouring. On stripped reed stems used for arrows, for example, the regularly spaced nodes marking the branching-off points of the leaves, which themselves produce a simple decorative pattern,

are smoothed and coloured to enhance the natural effect (Ibid.). Balfour calls his first stages in the evolution of decoration an adaptive stage. Man simply accepted and adapted effects which were accidentally suggested to him. In the second stage, the natural effect is imitated artificially, in places other than where it occurs naturally. This leads directly to the third stage, that of successive copying; for where the natural design has been once copied, that copy can be copied again, and so the motif takes on a life of its own (Ibid.). If a second motif is copied from a first, a third from the second, and so on, and if the makers of later versions have no access to the early members of the sequence for reference, then the character of the design can quite rapidly diverge and take on new appearances. One might say that a process of selection does go on with such designs, but according to presumably aesthetic considerations. It is those patterns which are most popular, or which best satisfy the critical eye of the craftsman, which are selected for copying and so preserved and multiplied. What could happen, evidently, is that some fortuitous details of the design thrown up accidentally are being picked on and developed, perhaps subconsciously, or expanded into new features, while others are being omitted. There is interpretation and hence selection going on in the copying process itself.

One can observe through the evolution of decorative designs, that a representational and decorative form, the arm of a human figure for example, was put subsequently to a functional purpose, that of serving as a handle. It is more usual to find the opposite process going on: that is to say, what is at one stage a characteristic of the construction, or a functional feature of an artefact, turns subsequently into a purely decorative motif. There are many

examples provided particularly by primitive artefacts. People make knives by lashing stone blades onto wooden handles by means of diagonal bindings of string or fibre. At some later stage it becomes possible to make the knife in one piece, or to joint the blade to the handle with pins, so making the lashing unnecessary. It is frequently found in such instances that the zig-zag linear pattern of the string binding is then imitated by painted decoration (H.C. March 1889). One may suppose that this is so the new design should conform to the old image or stereotype of what is appropriate for such knives to look like.

The term 'skenomorph' was introduced by H. Colley March to describe this kind of decorative form deriving from structure. Skenomorphs occur in pottery vessels which reproduce the characters of string and basket construction. In very primitive work of poor quality where the wet clay has not the strength to retain its proper shape, the pot is bound round with plaited or twisted bands during the firing. These bands, when removed, leave characteristic regular markings imprinted in the surface of the clay. In later copies where, through improvements on the methods of working clay, the restraining bands are no longer necessary, the patterns nevertheless are retained for decoration and are artificially imitated by modelling and incision of the clay by hand. Another example is the designs of modern cheap Italian wine flasks which display a kind of double skenomorph. Originally the flasks were blown into globular form, and they needed their raffia jackets to provide them with flat bases on which they could stand. Now the flasks are moulded, so they could well have flat bases incorporated. But they still keep their supporting jackets, which imitate the forms of the plaited raffia in plastic (H. Muthesius 1913).

We might expect that one area in which 'skenomorphic' decoration would be widely found would be in architecture, and here the examples are almost innumerable. Some instances of evolution in architectural decoration are to be found in those motifs which derive originally from natural forms. These patterns have often undergone considerable abstraction and formalisation, so that again their origin is not obvious. Connection has been, for example, traced between the spiral volutes of the Greek ionic capital and Assyrian palmette capitals, as well as to the Egyptian lotus (A.C. Haddon 1895). Besides this source, and the decorative possibilities arising from the textures of building materials, IT WOULD NOT BE GOING TOO FAR TO SAY THAT ALMOST ALL OTHER ARCHITECTURAL DECORATION HAS ITS ORIGIN IN STRUCTURE; either in the survival of functionally superseded forms, or in the application of previously structural forms to contexts where they are then structurally functionless.

There is certainly an evolution in architectural ornament, and its forms can be referred back to ancient prototypes (G. Semper 1878-9). Semper does acknowledge the phenomenon of skenomorphs. He remarks on how constructional features may be emphasised or exploited deliberately for decorative effect. It is very frequently the case, according to Semper, that a pattern executed in one material is then imitated in another, as for example, floor mosaics imitating carpets, or wall tiles imitating wall cloths.

Another view which emphasises the practical origin of architectural ornaments is Fletcher's. Fletcher says

"Many constructive features offer to us a manifestation of the tendency, always existing, which consisted in transforming into a decorative feature that which previously was only a practical need. In all styles certain combinations went gradually from the domain of the art of building, to pass into that of decoration, and thus the spirit of architecture was modified insensibly" (B. Fletcher 1897).

Frequently cited types of skenomorph in architecture occur in the copying of the forms of timber building in stone in which patterns of stone strips, applied in rectangular or diagonal lattices, imitate the structural members of timber framing. There has been some dispute over one particular instance of timber forms being copied in masonry, whether such is the origin of the general form and of many of the details of the classical Greek buildings. Fletcher suggests that at least some of the features of columns and entablature have this derivation (Ibid.). In tombs found in Lycia the characteristics of timberwork are copied exactly, right down to the details of mortice and tenon joints (H. C. March 1889). The roof construction in one tomb imitates the form of untrimmed timber poles laid side by side over the chamber, with ends protruding in a row of cylindrical projections. At the ends of the row are larger, squared members. The gable end on the tomb takes its shape from the triangular truss which would have supported a pitched wooden roof. Here is the origin of the Greek pediment and of a decorative form which has continued to adorn doors, windows, openings, and furniture to this day (See FIGURES 22, 23). From the gable end it is clear that the building is of a single storey only, since the doors are carried up to the full height. On the long walls are carved a second line of protruding joist ends, marking an intermediate storey. The stone structure copies a wooden one; and the line of guttae marks a floor level which is non-existent. Here is an example of one very common architectural feature, the 'string course', which although it frequently serves no strictly functional purpose, is often applied externally to mark the storey levels, and to break up a wall surface into horizontal bands (H.C. March 1889).

Philip Steadman, who cited most of this literature, suggests that many of the wooden skenomorphs of Greek building are naturally carried through to the Renaissance. It is not just that timber forms are copied in stone, but that structural forms themselves are used decoratively or symbolically. The pilaster, for example, which imitates the structural form of a free-standing column, has itself no structural role, nor does the pediment over the window or door which the pilaster supports. Another example of elements which lose their structural purpose and turn into decoration are the string course and the keystone of the masonry arch, which is transposed into brick construction, and even appears on openings which are not arched at all but supported on lintels. One objection was, therefore, that the Renaissance style, being a historical revival, could not be a true expression of the 'environmental' circumstances of its time (B.F. Fletcher 1897). Fletcher believed that

"the progress of historical styles in architecture is marked by a change from the use of one material to another. 'Vestigial' survivals, skenomorphs, occur during the transitional phases, but are signs of the immaturity of the new style and the lingering influence of the old. Thus it was only in the infancy of stone architecture that men adhered to wooden forms; as soon as habit gave them familiarity with the new material, they abandoned the incongruities of the wooden style, and all traces of the original form passed away".

It is a sign of the new style having achieved its true maturity, for Fletcher, that the new material is fully expressed and there is no vestige of the old remaining.

Finally, Steadman considers that the distinction between objects of a utilitarian nature and those which are ceremonial or decorative was clearly one of degree only.

10.4 SCHEMA AND PROTOTYPES REPRESENTATION

Two notions have been borrowed from cognitive psychology, blended together and used to form the base for our architectural and environmental understanding. First is the schematic knowledge and its implications in people's perception of various artefacts in general and building forms in particular. Second is the theory of prototypes in cognition and its 'elementary' influence on people's elaboration of the various architectural prototypes. This chapter is initially to illustrate the specific role these two psychological notions play in setting up our attitude to the environmental phenomenon which includes materials, objects, building arrangements and elements, and also the various aspects, relations and activities characteristic of certain ecological settings.

We have seen that a schema represents our knowledge about all concepts; those underlying objects, events, situations, actions and so on. It contains, as it has been mentioned, the network of interrelations which is believed to hold among these concepts. It is quite significant, here, to advise that the next argument is in architectural terms. As schema underlying a concept (e.g. roof) stored in memory corresponds to the meanings of that concept, meanings are encoded in terms of the typical situation or events. These usually evolve out of previously elaborated prototypes which form that concept (see the previous chapter). People usually acquire concepts by exposure to a range of objects belonging to a particular category. This exposure leads a person to form a prototype that best represents the total set of stimulus objects (Franks & Bransford 1971; Mervis & Rosch 1981).

These studies and many others, however, have shown that categories (various roofs, for example) are learned more rapidly and

more accurately when people are exposed to typical or representative members (pitched or normal flat roof) than when they are exposed to non-representative ones (e.g. geometrical roofs of many modern buildings). It is, for example, difficult to imagine that anyone would try to teach a young child the concept of 'bird' by exposing the child to ostriches or penguins only (M.W. Eysneck 1984).

In simple words, our knowledge of a window, a building's articulations, a roof, a wall, etc., corresponds to the most typical meanings of these concepts. Meanings were built following adaptive processes of refinements and modifications of previously created prototypes along with the discovery and use of various building materials or emerging circumstances. We have already demonstrated those processes and shown the elementary relation between organisms and the various substances. Such a relation is strongly embedded in the various types of schemata. It is argued here that what led to the success of vernacular building forms, for example, is both the cognitive values which they represent of their constituent elements and the full realisation of the natural properties of their materials familiar to the builders.

In the following pages we will study, in great brief, the meaning and schematic representation of materials, building elements and arrangements and their activities which conform to their authentic ecology. We will come to illustrate and look at how these representations could be taken up by architects and design theorists and apply them practically to the design of new buildings.

10.4.1 Materials

Local building materials, taken from the environment of the settlement, require no calculations which technological building

materials require today. Reed, thatch, brick, stone, clay and wood have an extremely different impact on man than do the present manufactured materials. Man stores a profound knowledge of natural materials which enables him to handle them according to innate properties that cannot be changed and are usually accepted; such properties are stratification, grain, density, response to load, thermal capacity, absorption, elasticity, shear, moisture, aging, hardness, and so on. Successful design of a building should then depend on a familiarity with these properties which comes from long observation and also across long processes of inherited knowledge communication.

While calculations are currently made to avoid weather and time as the most destructive forces acting on technological materials, native builders regarded these forces as building aids. We may have noticed that arrangements and materials used to meet these forces in vernacular buildings actually give the buildings their aesthetic capacities as well as conformity with their physical, cultural and social contexts. In stone structures, force of gravity sets stone on stone. The aging of wood stops warping, and the absorption and evaporation of moisture make wooden roofs breathe with the rhythm of the weather (S. Moholy-Nagy 1957). Vernacular buildings offer concrete virtues; appropriate application of a material to its uses, extending its range and exploiting its capacity but not forcing it to behave in a manner inappropriate to its nature. Vernacular structures may be classified in terms appropriate to modern scientific theories of structure. The tensile structures of reed huts, the mass walling of mud adobe houses, the reinforcement of mud walls with palm branches, the frame structure of timber houses, all affirm the integrity of the principles of structure. That is, every material reacts differently under forces of compression, tension,

or torsion, and assumes its own forms of resistance. These particular forms are for each material an integral part of the design 'knowledge' of the material. There have been no mistakes among vernacular builders as to which material is used in forms that belong only to another material. We perceive the built environment under a schematic attitude; that the design of a building is composed for a certain material, or within certain articulation of materials. If, for any reason, a material occurs in an exotic situation, this will 'disturb' our schematically determined perception at least for reasons of inconsistency. Consistency means the close union of material and design so that one seems to be the necessary result of the other to such an extent that it becomes difficult to decide if the design was the result of the material, or if the material was chosen because of the design (See FIGURES 24, 25, 26, 27).

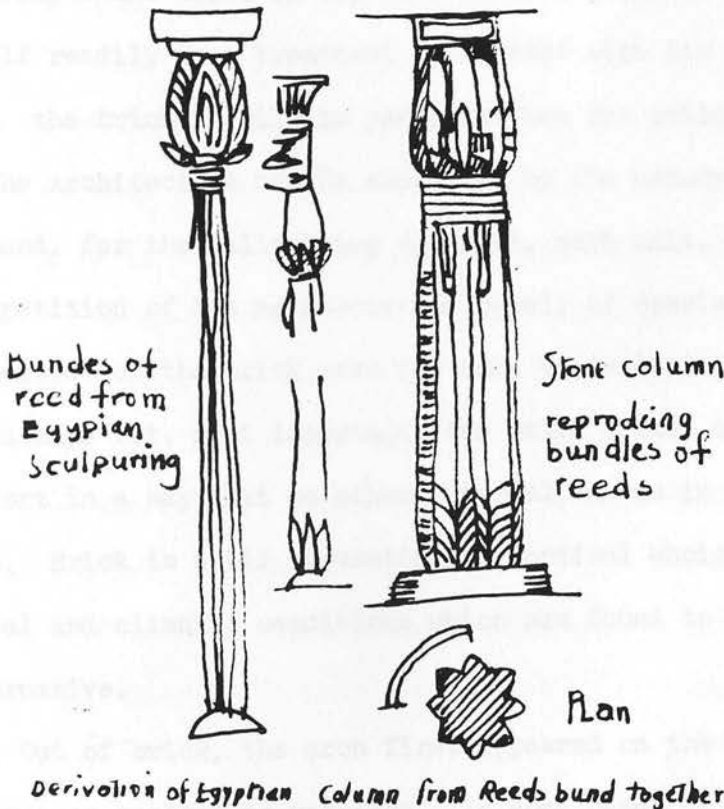
Both native architecture and historical styles provide us with evidence that materials are the media in which architectural designs are expressed. Thus the influence of people's discoveries and experience of materials on architecture is undoubted. The successive periods in any region have their distinctive materials, of which they seem to have exhausted the possibilities, and their resulting methods of treatment are the basis of what is afterwards classified as styles (B.F. Fletcher 1897). Fletcher stated also that

"changes of style are forced on by the use of new materials, to which at first the old forms are applied. After a period the old forces of tradition and prejudice are laid aside, and the new forces of utility, reason, and cost draw attention to innate qualities of the newer materials, which, finding expression, develop to a greater or lesser degree of perfection a new style".

Architecture, accordingly, is an affair of material, the true use or needs of which mould the style, and that style is created out of the qualities of the material that has to be employed. Fletcher

cited some examples to prove his argument, starting with ancient architectural styles. In Egypt, primitive architecture of mud or puddled clay and bundles of reeds is discovered, changing in later times to a style of stone and granite.

The primitive structure was composed of bundles of reeds bound together and placed at intervals vertically in the ground. On these reeds, and joining them at the top, were laid horizontally other bundles, which bound the heads of the uprights together. The origin of the characteristic cornice is held to be due to the pressure of the clay (of which the primitive roofs were constructed) on the upright reeds, which formed the framework of the walls. These reeds were held in position by being bound to the horizontal roll resting on the top of the columns. This formed the slightly projecting cornice, the reeds keeping the rammed clay in a projecting position and allowing the curve to be terminated by a flat fillet which gave the level of the terrace (Ibid.).



Fletcher mentioned that a very distinct recollection of the primitive reeds tied together at intervals, and crowned with the lotus bud, is found in the later granite column and capital. Examples in stone of capitals and columns derived from timber and reed originals were then copied and spread in the Greek and Roman world til very late stages. It is hence clear that in so far as material is concerned, the traditional forms, hallowed by long use, were clung to and reproduced when the method of building which suggested them had been replaced by other systems. Egyptian art proceeds on an uninterrupted line or course of tradition, and when necessity dictates a change in the methods of construction, or in materials, the immutable form is not thereby affected, but is perpetuated in spite of novel conditions.

The influence of material on architecture could be traced strongly in Mesopotamia also. The country possesses an abundance of clay which, being thrown into flat square moulds, beaten and compressed and dried in the sun, gives a material which lends itself readily to a treatment consistent with its qualities. With the brick it will be perceived how the salient characteristics of the architecture may be explained by the nature of the materials at hand, for the walls being of brick, each unit, in general, is a repetition of its neighbour and rarely of special shape. Major properties of the brick were not only those concerning the external appearance but, most important, the brick worked out the thermal comfort in a way that no other material can do in that particular area. Brick is still presenting the optimal choice to face environmental and climatic conditions which are found to have no parallel alternative.

Out of brick, the arch first appeared on the architectural horizon as applied to openings. In some cases it is not a true

arch, but one formed by corbelling or projecting horizontal courses. Fletcher stated that it was a general law that the arch was soonest discovered and most invariably employed by the Mesopotamian builders who found themselves condemned by the geological formation of their country to the employment of the smaller units. The arch rested on thick and solid walls, prominently placed in the most careful and elaborate facades and forming an imposing entrance and accentuated by a brilliantly coloured soffit, which held and still holds a place of extreme importance in the whole field of architecture. The arch was invented in Mesopotamia, then used by the Etruscans, from whom it is supposed the Romans obtained it. The Romans were the first to carry it out as a structural system, and by its use they covered the largest areas even now in existence, roofed with stone.

In the thirteenth century the Gothic spirit employed materials at hand according to their nature; it sought for those laws of elasticity and equilibrium which were to be substituted for those of inert stability, the only laws known to the Greeks and Romans. In regards to constructive features, the Gothic builders contented themselves with forming the transverse and diagonal ribs of their new system of vaulting on centres. Timber in quantities required for centring as in Roman vaults, and materials for their construction, not being at hand, these arches became permanent centres on which panels of thin stone could rest. The arch, therefore, absolutely determined the form of the support. The arch determined not only the structure but the form which it took, and the architecture is dictated solely by the arch. Thus material, through the form which it dictated, influenced architecture in this period (B.F. Fletcher 1897). Fletcher summarised his opinion by stating through his essay that

"any true architectural form is not the result of caprice; it is only the expression of the structure. The column is a real support; if its capital is expanded, it is to sustain a load; if the mouldings and ornaments are developed, it is because such development is necessary. If the vaults are divided by ribs it is because these ribs are so many sinews performing a function . . . No such system of construction, it is evident, could have been developed without the employment of such a material as stone, laid in tolerably small courses with mortar joints, which gave the necessary elasticity to the various pressures".

The influence of material in northern and central Italy caused a divergence from the Gothic type. In Italy the abundant and beautiful coloured marbles induced the elaboration of a plain wall treatment that reduced mouldings to flatness and comparative unimportance as in the cathedrals of Florence, Sienna and Orvieto. In the use of terra-cotta and brickwork, in Italy, the influence is evident, the plastic state of the material rendered abundance of ornament easy of application, and a smallness of detail followed. A flatness and want of shadow is necessarily characteristic of brick buildings, sufficient projection not being obtainable for cornices, but such can scarcely be deemed a fault in the material. It was always tolerated by the Italians, who allowed the material to express its own capabilities without trying to disturb its architectural function.

However, history points out that there is no escape from the influence of material, nor from any feature, however arbitrarily developed subsequently, that did not have its origin in the special qualities of some material and structural requirement to which it owes its birth (B.F. Fletcher 1897). Fletcher goes on emphasising that in architecture materials must indicate their functions by the form we give them, and these should conform to their nature. This has been more or less easy for past styles, working in natural materials having no very great contrasting qualities, but it is

very difficult now when a requirement to make use of materials which possess different and even opposite qualities is a major step in the design task.

10.4.2 Architectural Elements

All buildings have to meet certain physical constraints. Understanding the general physical principles that affect the structure of a building and the means and methods of assembly of materials employed in its construction helps to appreciate the achievements of indigenous builders. All materials have weight, and all buildings are affected by the forces of gravity; structural systems transmit the gravitation loads to earth while creating the volume needed to meet the function of the building. In addition to the stresses imposed by the elements used in the building itself, there are other stresses which may vary considerably according to climatic conditions, the relative stability of the site, and the way of life of the occupants. These stresses can be classified as 'tension', a stress which pulls apart the particles of matter and has a stretching effect, such as the strain on a guy rope; 'compression' where the particles are pushed against each other with a shortening effect as in column or solid wall. Most properties of building materials are very well known by the normal builders who can make the best use of them. Among these properties is deformation, which creates 'yield', where a material will not return to its former shape. Bending is a combination of both tension and compression. A beam which is bent has its lower surface in tension and its upper plane in compression. Over a period of time poles and beams may deform permanently through being held in one position. Roof weights usually exert thrusts on walls causing curvature of the wall from bending stresses. A

tie-beam is frequently used to counteract this effect. To stabilise the structure, buttresses may be used to create a counter thrust against a bending wall in order to achieve equilibrium.

These are just a few examples of the arrangements necessary to meet physical and structural requirements. We have seen that many elements, in addition, have been elaborated to create the volume and to carry loads of both the construction and life and wind stresses. It should be understood that many of these elements and arrangements are usually manipulated in a way that exhibits a tendency towards enhancing the beauty of building in decorative ways.

In the following pages we will study some basic prototypical elements of architecture and show their cognitive implication on people's perception of the built environment. The intention, actually, was to introduce this subject in a rather more detailed way, exploring all their aesthetical, psychological and sociological aspects. For some practical reasons, I will have to put more emphasis on illustrations hoping that they will serve to communicate the same thoughts, insights or meanings I would demonstrate in writing.

1. THE ARCH

In evaluating the visual properties of a building, one is cognitively inclined to distinguish between those that belong to the building by virtue of their real structural or functional representations and others which imply no actual role in pulling together the building. The arch has vividly contributed to the enrichment of building's aesthetical endowment during the various stages of architectural history, owing greatly to both its structural and schematic values. On the one hand, primitive architecture and almost all historical styles used the arch as a basic

structural element. On the other, modern architecture has discovered the fascination of the arch as a decorative or revival element by attaching it to the building in a superficial, nonstructural way. Nevertheless, even such an artificial approach serves to add a taste of originality and hence induces a feeling of real security usually associated with 'authentic arches'.

We have pointed out elsewhere in this study that organisms approach some objects or events in nature with a provision of innate knowledge antecedent to any occurring experience owing to a central notion that both organisms and these objects are of the same essence. If I were allowed once in this thesis to make a dramatic statement, it would be that the knowledge of arch is one of no precedence but is embeded deeply in the organism's neural system, in its consciousness and sentiments.

Of all the cognitive values of the arch which may support this theory, none is more impressive than the obscure feeling of relief and security that a scene of an arch, 'especially an authentic one', induces in almost all types of observers, especially those who are highly educated architecturally. We certainly do not explain such an attitude only in terms of the structural equilibrium and state of stability the arch represents. Such a state can, no doubt, be displayed in many other instances, but they do not necessarily exhibit the same impact that an arch usually does.

Of course there are numerous reasons why an arch has all this powerful schematic image. First of all it responds to a biological analogy evidently in the curvature of an arch which looks like the shape of a human skull, the eye brows, the hips, the two lips, etc. In fact, there is a valid conclusion that can be drawn from the presence of the arch looking like structures which are abundant in

nature and also in the universe. The crucial assumption is that familiarity with these natural phenomena, particularly in the early stages of human bio/cultural evolution, had its effects on shaping human responses to resemblant elements such as the arch. Among these were the incomplete stages of the moon; the crescent, cave entrances, natural structures which usually bridge the gap between two masses in nature like mountains, assembly of rocks or also as in ice bridges and many other natural phenomena to which man showed a great respect or fear. Human interpretation of these objects has led him consequently to see in the arch a symbol of power, perfection and identity. In one extremely important stage of the history of architecture, the arch was not a mere primary structural element, but it was Architecture itself; we, no doubt, mean the Gothic style. Yet the most strikingly prevailing manipulation of building structure and construction in many primitive cultures is still achieved by bending and curving its native building materials so as to meet the structural requirements in a naturalistic and perpetual way (See FIGURES 28, 29). The arch, then, is not characteristic of a certain era, it is an eternal spirit which symbolises continuity over time. Its presence brings about a profound commitment to architecture by arousing some kind of existential feeling of dignity, perfection and belonging to history and time. It is, hence, more than an optimal employment of a material's natural properties in building, but an element which motivates the deepest cognitive memory of mankind.

It would, perhaps, take more than one can imagine to speak of the various psychological implications of the arch. I would, therefore, prefer to let some selected illustrations do part of this task. It is important, after all, to cite here that the literature

of architecture did not spare effort to speak of the arches, particularly from a structural and aesthetical point of view. What concerns us, in fact, is the arch's impact on people's schematic structure in which its aesthetical endowment is an expression of tangible and virtual properties but not as a mere concept. In other words, we have to confine the use of arches to their structural performances rather than to enhancing the building facade in such an artificial way as many architects do today (See FIGURE 30). An authentic arch should, therefore, suggest the real material used to build it with all the features which accompany such use, like a brick or a stone pattern, their colours, textures and other genuine perceptual attributes, familiar to man's knowledge of these materials (See FIGURES 31, 32, 33, 34).

2. THE ROOF

Man's first idea of a shelter was a roof. A roof has been for quite a long time the most important element in any building. There is still a large number of the world's population that lives without being sheltered by walls, but only by a roof. Man's first thought, when brought back into primitive circumstances, whether it be during summer hikes in the mountains or cold zones in winter, is to protect himself against all kinds of weather extremes by some sort of a roof. In no part of the building, therefore, has native man expressed his logic better than in the roof. It is designed differently according to local climate and the kind of material available. Climate is the reason for the slope in pitched roofs, while the local soil condition might dictate the choice of a certain material. We might find, for this reason, quite a similar solution given to the roof in places extremely far from each other. There

exist immense evidences that basically what determined early roof prototypes was purely geographical conditions. We can say with great ease that a roof is the most difficult element that a culture has influenced. Almost all the characteristics and the various alteration and variety of roof designs found in one certain area pertain more to physical rather than cultural or aesthetic motives. If we perceived some differences in roof designs within one area it would be mostly attributed to minor alterations the designer makes on some complementary features such as the attic storey, chimnies or size of upper accommodations (See FIGURE 35). However, we can notice one phenomenon which has persisted without interruption and which has been used since the beginning of time: the thatched roof. This is mainly because thatch is the most versatile roof covering and is one of the best known insulation materials in almost all kinds of climatic zones. But material is not only what characterises a roof. The slope is also an important feature and it is almost entirely decided by climatic factors. In the alps, where snows are heavy, the roofs are slightly sloped, with a wide overhang and covered with wood shakes. The reason is that snow accumulates on the roof and clings to the wood, whereas a stronger pitch would make it slide. It soon builds up a cosy blanket offering a powerful insulation against the cold. The wide overhang also permits the farmer to reach the stable at the rear without shoveling snow.

In places where precipitation becomes rain, we may find the roofs are high-pitched and are usually covered with small flat tiles shaped like the scales of a fish on which the water glides as on the back of a duck. In places where heavy rain storms and winds are frequent, such high hats would be carried away by the

first squall. Here roofs are low-pitched, but covered with very heavy tiles as light wood shakes like those used in the Alpine houses would be blown off. Each tile is designed so as to be a little gutter to evacuate the water faster, but heavy enough to withstand a high wind (See FIGURE 36). If one travels around the world, he will be faced with quite a large variety of roof designs based initially on meeting various climatic requirements. Native builders are usually aware of the way to meet the local climate and they inherit a knowledge which they apply whenever it comes to building new dwellings. It would be difficult and risky to induce any alteration on the kind of material, slope or other characteristics without serious consequences on the roof's climatic performance. Hence what usually we see in the different shapes and designs of roofs over culturally and geographically different areas are interpretations of such determinant circumstances.

We mostly come across two types of roofs: the flat roof which we introduced in Chapter 6, and the pitched roof which has by now become wide-spread. In general, we may bear in mind that a roof is a building's termination towards the sky, a second plane between sky and earth. It is the crown of the building, the evidence of its meaning showing the pride and dignity of the building itself. It is such an important part of the building that native and traditional architecture have awarded it a strong visual effect and it is difficult to imagine the building could be perceived without it. It is true that man has worked hard to attach beauty to his dwelling mainly through enhancing the design of its roof. In many instances the roof is so dominant that one may imagine the whole building has been projected from its roof but not the other way. Modern buildings have the disturbing effect of lacking real roofs which would interrupt people's image of the authentic building with its

roof being the most integrated and highly dominant part of it due to the significance it implies in their cognition. It would take such a long time for man to eradicate this image, and until then one may find no logic to convince him with any alternative. The modern building starts from the earth and ends nowhere in the sky. A traditional building starts from its base where it has to communicate its particular relationship with the earth and it ends at the top where man has accumulated immense meaning to its roof (See FIGURES 37, 38, 21).

3. THE WALL

The actual cognitive representations of walls are those which are most related to the prototypical versions of this significant element of architecture. Before social and community life, which necessitated walls for privacy, emerged, and prior to the establishment of the early farming settlements which required territorial division of dwellings, man should have borrowed the idea of 'wall' from nature for the purpose of protection against all prevailing dangers of weather, enemies or animals. Our profound conception of wall is still strongly inclined to an image of walls of considerable rigidity, thickness and weight so as to withstand stresses of wind and other destructive forces and also to strengthen our conception of spaces whose boundaries are drawn by these 'real walls'. One important reason which underlies the feeling of security provided by walls is familiarity with their materials, particularly when left in their native condition so as to exhibit their authentic colours, textures, pattern of construction and maybe their smell. Materials like stone, brick, wood, straw and mud are certainly easily perceived with an immediate familiarity owing to stored schematic knowledge which induces in people an obsession and intimate

feelings towards buildings constructed by these materials. Perhaps the most thorough and influential implication of these 'natural' materials is that they produce structures, in particular walls, which are rigid, strong and persistently connected with earth so that their articulation and distribution are thoroughly determined according to purposeful pattern. On the contrary, industrialised walls are paper look like and are articulated as if according to arbitrary or abstract thoughts but not to concrete human purposes. A solid conception of space is maintained only when space boundaries are of such persistent qualities which familiar materials can often produce. We can argue that the difficulty with space within the modern movement is that space lacks authenticity of boundaries, weakness of identity and diminishing socio/cultural meanings which are thoroughly evident in the lack of response and disruption of people's cognition.

Today, people move frequently and houses are increasingly built of factory-made materials; finished plaster board, aluminium windows, prefabricated kitchens, glass, concrete, steel - these materials not only do not lend themselves to personalisation but they are far from inducing a feeling of security due to their vulnerability towards fire, wind, moisture and also aging. Smooth hard flat industrialised walls make it impossible for people to express their own identity, because most of the identity of a dwelling lies in or near the walls. The wall is the place where early man used to keep most of his tools. It is where people of vernacular cultures still keep their belongings, lighting fixtures, built-in furniture, cooking utensils, etc. The wall, after all, is the natural device to maintain thermal comfort in many climatic areas by adapting its thickness so as to meet the physical requirement of heat transmission from in - out and vice versa.

All this means that walls must be made of considerable depth and of material whose structural, thermal and other properties are inherently familiar so that however much of it is concealed or carved to contain shelves, cabinet displays, deep windows, niches etc., the whole wall remains rigid and can sustain thoroughly its distinct character as an independent element (See FIGURES 39, 40).

4. THE COLUMN

Of the greatest symbolic meaning and structurally most effective element of building is the column. With the use of columns a creation of space is achieved with an entirely minimum amount of matter. Probably the most likely definition of space is that it is not a mere volume. A space is a volume which has meaning and it is highly perceived only because it evokes profound memories of aspects that were once significant for man's living. The notion that a column can create an intimate space suggests that a column conveys such memories which the most bulky and most imaginative arrangement of walls would fail to evoke.

There have been numerous archaeological studies which show that columns were the latest elements to be elaborately employed in the architectural designs of the early historical cultures in comparison with walls, roofs, windows, etc. The most early version of the column was a simple vertical object used as an indication point or guiding element to mark the place where man, a couple or an assembly of people resided. Like a tree functions to gather people under its shade, the first piers acquired their social significance before they were implemented to support the simple roofs of thatch or assembly of tree trunks. This might explain why people in the present time tend to experience a kind of relaxation and security whenever they lean against a column in a public place! It might

explain also why people enjoy a very deep feeling of identity and belonging whenever they approach a column or see it in any building even when it is used for non-structural purposes (See FIGURE 41).

As we have seen previously, the early column developed by the Egyptians was composed of reeds bound together with the capital consisting of lotus leaves. From this prototype, successive types of stone columns were developed by the Greeks, the Romans and during the various European styles. The concrete image of the column which is related to the Egyptian type resembles in large a tree, whether in its external shape or in its basic structural organisation. It resembles initially the stick used by prehistorical populations to mark a point to drive cattle or to create a wall using several of them. "In ancient times, the structural arguments for columns coincided in their implications with the social argument. Columns made of brick or stone or timber were always large and thick. It was easy to make useful space around them" (C. Alexander 1977).

5. THE WINDOW

Before windows were used as elements of composing external facades or implemented to control and achieve optimal vision opportunities, they were basically mere holes in the walls to bring in penetrating light and also to control thermal conditions for the comfort of man. It is deeply written in man's permanent memory structure that a house is a place where safety and security is achieved against external dangers of enemies, extreme weather conditions, and the like. The size and figure of the window, thus, were decided ultimately to be as small and precise as possible, yet giving the best satisfactory effects of light, vision, ventilation and safety. Therefore following this condition, windows have acquired a very distinct shape which was maintained over centuries of evolution of building design until the emergence of the modern movement. With the distinctive rectangular window, one may think of a sunbeam striking upon a wall, or of the play of light and shade creating bright and dark zones in a room, motivating our awareness of space. One important aspect which is associated with the rectangular and hole-look like window is that it achieves a quality of lighting dependent on time of day, season, weather and density. This results in certain though changing light atmospheres which we experience as harsh, soft, dazzling, sparkling, misty, etc. It is very much acceptable that excessive amount of light is exhausting for the eyes, thus a single source of light offers an opportunity for the space to be lit in a much more appropriate and exciting way.

Today, people of various belongings are strongly inclined to the use of big windows or window walls brought about by modern designs. The more glass there is, the better the design is, even if this implies harmful effects of ignoring climatic and other

environmental requirements. The fact that we can now make window walls as total as we want to, has blunted our sensitivity to the special value of light. Furthermore, the window frames a certain part of the environment and makes it into a kind of picture, but one which is changing constantly. The awareness of the outside world is intensified by a smaller window. Contrary to this, our awareness becomes weaker the bigger the window opening is. Therefore, windows or glass walls which are too big, which open up the room totally, make the room uncomfortable; the feeling of safety and security associated with the single window is lost and the significance of the window as a cognitive element strongly integrated with the whole architectural form of a building is totally diminished (See FIGURES 42, 43).

10.4.3 Characteristics of Structural Derivation

Many of what appear to be decorative features in the form of plants, animals and immense types of patterns, ornaments or carvings have, in fact, their origins in the structural and maintenance function of which builders of various eras and places are aware, although perhaps subconsciously. Without even a slight degree of uncertainty these various characteristics have set up the aesthetical characters which distinguished the various historical styles and yet form the main features of native and vernacular buildings, which architects in particular usually admire for their function, purity and beauty.

We mentioned early in this chapter that all materials have to meet certain physical constraints. Whether by experience of trial and error, or by a kind of biological instinct, man has learned how to deal exploitively with the structural and constructional properties of building materials available for his benefit. We'll shed light

on this particular issue which should be strongly considered as vital for setting up the architectural aesthetics beyond the fallacy of the pure abstractional derivation of modern aesthetics which I find extremely irrelevant, trivial and misleading. Equally trivial are those nonfunctional decorations and characteristic treatments of buildings which many designers invent in an attempt to emulate those of native and historical buildings. The matter is not, in fact, that we ought to allow designers the freedom of decoration just for pure aesthetic reasons. The issue is that these decorations and details have to be of utilitarian purpose; function primarily to enhance the structural performance of building and serve to better the resistance and maintenance of its materials against erosion, aging and other destructive effects of weather, etc. In the light of this notion, however, the difference between vernacular and high style forms lies in the perceived distinction between authenticity of the first one as opposed to artificiality and the pretentious and purposeless nature of the latter. In summary, continuity of copying in vernacular societies maintains the unity and originality of building forms through the flow of inherited information and knowledge of building activity and builder's skills. What seems to be responsible for the discontinuity and disruption in modern environments is that modern forms are arrived at as mere personal and disrupted inventions of their own individual designers. At a more specific level, discontinuity is a natural interpretation of the difficult nature of such imaginative forms for the understanding of both architects and builders which is largely expressed in the resistance of these forms to emulation and copying.

What follows, thereafter, is that architectural form is not the expression of a barren and an absolutely abstract idea. Form is the characteristic putting togetherness of the various parts of a

building so as to achieve the optimal and most durable physical performance that responds to people's specific eco/cultural context and whose knowledge resides in their cognitive system.

What may explain the tendency to consider the putting together-ness and the characteristic arrangements of buildings as having enduring cognitive representation or permanent schematic images is that to arrive at this, they do not exhaust an act of recurring calculations, nor do they result in errors, imply harm, or exert a series of examinations to test their appropriateness as is the case with much modern architecture. It would perhaps be more useful for the understanding of these arrangements to introduce them in explicit illustrations with rather brief descriptions. However, these illustrations will have to be considered as just a few examples among the extensive arrangements that the world's variety of architecture usually displays. The principal aim of arriving at a concrete understanding of what underlies these characteristic features is that once such an understanding becomes possible, designers would be able to manipulate their design ideas following the same principles of authenticity and purposefulness rather than attempting further imitation or inventing more fantasies.

1. One of the most influential features is that which basically functions to strengthen the surface of walls, columns and other elements. Though it appears as if the design meant to enhance the architectural appearance of a building, the actual purpose, cognitively implied, is that such characteristic treatments are fundamentally a basic requirement to keep intact the surfaces against long cracks, expanded erosions, and so on. These arrangements include sharp recesses, carvings, recessed mortar lines, ornaments, subordinate members and all possible effects facilitated by properties of specific building materials (See FIGURES 44, 45).

2. The second important features are those related to arrangements to increase moments of inertia. They most normally take the shape of enlargements in some parts of the building elements as an aspect of elaborate decorative features. The actual function of such features is to enhance the structural performance of these parts, particularly in withstanding various side forces of the building loads, winds and the like (See FIGURE 46).

3. The most common feature of timber buildings is the use of auxiliary members of various scales to enhance the structural performance of the main elements of the building (See FIGURE 47).

4. Another very useful structural treatment, usually widespread among brick and stone structures, is the recess and buttress method which serves to strengthen the long, heavy and high walls of a building. Since the making of brick in Mesopotamia, ancient people of this area have elaborated numerous patterns of recesses and buttresses which formed the basic architectural characteristics of their great buildings. Till the present time such basically functional features are attempted almost all over the world giving to the buildings of various materials their appreciable and powerful appearances. However, this method was extensively adopted in many buildings of the Islamic world and has been considered as a major feature of the mosque and other religious establishments (See FIGURES 48, 49).

5. Featuristic treatment of the structural joints such as those mentioned in Article 10.3 Certainly any type of building material would tend to require certain ways of joining various parts of a building and this way becomes a permanent feature of that type of construction (See FIGURE 50).

6. Numerous apparently decorative elements function basically to avoid torsion, deformation, deflection, bending and other types

of structural stresses. The shape and size of these elements vary according to the scale of a building and to its building materials (See FIGURE 51).

7. In order to achieve better and more balanced distribution of a building's various loads, man developed many decorative features to achieve this vital purpose, especially in stone and brick buildings. What appear to be decorative elements of corbelling and projected beams, cornices, stone or brick patterns, are in fact, arrangements to achieve equilibrium and stability of the various forces which act on a building (See FIGURE 52).

8. Features used initially to achieve load transition especially roof loads to the building base. They include column capitals, girder beams, and other features specific to each building material and its design (See FIGURE 53).

9. Builders of ancient times discovered that joining two different materials together in one level would tend to result in immediate and long cracks. The same thing would happen when an element's surface comprised two or more vertical or horizontal levels. To avoid the disturbing effects of such defects, builders have invented many specific methods to deal with them.

10. When a surface of any part of a building is composed of more than one level, the likely event is that a crack or partial damage to the sharp edges of the various surfaces would occur, resulting in the need to employ certain methods of covering and concealing with patterns or decorative elements.

These are just a few examples; most certainly there are many more 'stylistic' treatments which people elaborate in order to deal with defects and also to enhance the structural performances of their building and to avoid the bad effects of aging. It is fairly

certain that what is attributed to the quick aging and the rapid deterioration of many modern buildings is a lack of similar protecting precautions which modern architects normally describe as mere purposeless decorations! (See FIGURE 54).

10.4.4 Features Environmentally Derived

We have cited explicitly many examples of building arrangements and devices to meet the requirements of comfort and ease against the variation of climatic conditions (See Article 8.1). To a great extent many of these devices have become persistent features, inseparable from the basic design idea of their buildings. However, the architectural response to climate and other physical conditions has produced, for example, various types of shutters, sunshades, vine trellises, wind catchers, etc. In addition, excessive light and heat are harmful and their effects can be reduced by the use of verandas and balconies. The protection from wind and rain has presented the porches, arcades and other similar features. But the effects of rain are clear in the way the building form is determined as well as in the many characteristic devices and elements to protect from rain - drainage devices and so on. The need for fresher air for better health has prompted builders to invent various kinds of air-catchers, window types and a variety of openings. Generally the principles of climatic control that founded specific featuristic devices are the actual generatives behind many arrangements which appear to be of social implication such as balconies, porches and the like. While some features, indeed, have been invented essentially to meet environmental requirements, they became in time elements of entirely social and aesthetic significance. Whatever the case, these features are not just complementary devices, as many believe,

but in fact they form the essential elements behind the design idea which architects and people equally appreciate. Perhaps it would be more useful to study these features by introducing them in illustrations, but the illustrated examples are just a few instances of arrangements which are abundant in the architectural traditions of the world (See FIGURES 55, 56, 57, 58, 59, 60).

10.4.5 Activities Consistent with their Ecology

We have been informed by the school of cultural ecology that man establishes strong and enduring ties to his ecological setting according to which his socio/cultural context is shaped. We have been consequently introduced to the notion which suggests that for the interest of any cultural group, technology and the various exploitational activities have to be environmentally oriented. In other words, man develops tools, invents techniques and establishes activities which primarily serve to better his investments in the economical opportunities and resources offered to him by his local environment.

A major characteristic feature of a cultural group is, hence, its preoccupation with activities mostly related to the group's cultural core, which usually results in the deployment of various social behaviours, norms and lifestyle. One would find strong evidence of this notion in the case of the french wine producers. It is quite certain that much of their social traditions and lifestyle are strongly dedicated to, if not entirely determined by, this occupation facilitated by the land and all the activities related to it. The phenomenon of every day vegetable and meat marketing predominant in the arid countries provides another example which can be explained only in climatic and environmental terms. Due to the decomposing effects of high temperature on food products

and the lack of mechanised systems of cooling, it was found that only every day selling of the agricultural products could solve the problem. It would be rather trivial to replace this activity by deployment of the superstores which would result in increasing demand on energy and entail drastic changes in the entire social structure of these societies. The prevailing conditions of the abundant reed, fish and water of the marshes area in southern Iraq were the principal responsible factors in shaping the culture and social structure of that place. People there are usually engaged with few economic activities provided by their severe environment to the extent that social stratification exists between the only two categories of people; those who are engaged in fish and those who collect and manufacture reeds. Though these are very specific examples, such strong relation is maintained even in many modernised societies such as Holland and the fascination for flowers.

The unfortunate fascination in technology and industrialisation has led the authorities in many developing countries to build industries based on exported experience and technology inconsistent with resources, their environment and which caused great harm to the basic relationship between people and their land which existed for centuries.

But this is not our only concern. Building performances have suffered great defficiency in recent years due to changes in activities which are related to ecology and hence affect building form, orientation and building materials. Buildings today no longer represent people's affairs. They do not lend themselves by any means to the basic activities which represent people's relation to their setting and hence have lost major and essential cognitive meaning.

10.5 STYLE

The reason behind attempting this perhaps most fascinating subject in architecture is one of great importance to this study. During the preparation of this thesis I was asked to give my explanation for the ever-changing styles and ideas of design within the same environment. As this question actually followed my introduction to ecology, it seemed to me that the impression was that ecology was considered as a group of unchangable physical factors, mostly associated with climate, topography, resources and so on. And yet the study has introduced an entirely different approach based on thoughts of the school of cultural ecology. Ecology, accordingly, includes, besides the environmental features, all the social and cultural values and norms on which man elaborated to strengthen his relations to his physical setting (See Chapter 4). There is no doubt that the further sophisticated the social and cultural achievement, the better the exploitation of the setting. There is, hence, an ongoing process of interdependence and mutual changes between the physical factors and culture in which culture maintains its specific structure stable though varied between one stage and the other. One feature that visually expresses these changes in architecture and art is 'style'.

According to Roger Scruton, a style is not the invention of one man only; only in exceptional circumstances can an artist entirely create his own style, and even then he ignores established practice at his peril. Hence one can suggest that where there is a free choice of styles there is no longer any style, and therefore no true freedom (R. Scruton 1979). Scruton suggests that a builder produces precedents and examples, and is likely to extract from them some system of principles, some repeatable set of answers to the current

problems of construction. That is, for the builder the dimension and shapes he chooses might come to have a comfortable look; it is so executed as to embody a value, and this value might find its correlative throughout his experience; it is not specifically aesthetic in its meaning. We can see, then, the acquisition of taste being built up from successive layers of sensuous and intellectual choice. Certain forms appeal to us - we choose them in preference to others - and this phenomenon is primitive in the sense that there is initially no reason why we do this, even though the experience that determines our preference is one for which reasons can be meaningfully adduced. Only then, according to Scruton, do we begin to search for such reasons, and in so doing endow the chosen forms with meaning - we come to see those forms differently. The process may be repeated and new ways of seeing emerge. The result may be the discovery of a style, not as a body of rigid rules, but an architectural vocabulary, the endpoint of which is to render an appearance, not only comfortable to the uninstructed, but also intelligible to the instructed eye. The outcome of this development, Scruton argues, is a sense of the validity of certain architectural forms. Certain forms look right, and looking right they reassure us of the values that seem implicit in them.

And yet it is this system of principles, suggested by Scruton, and which one thought to be brought about by the antecedents that are vital in building up the style. There have been, of course, many interpretations as to how these principles may vary from one author to another. A style, according to Viollet-le-Duc, is in general what is achieved by adherence in design to logical, structural or functional principles. A building, then, which is well adapted, will have style. True style in architecture will be produced by keeping to equivalent principles of adaptation, according to our study.

And these principles are certainly the structurally and environmentally derived arrangements which are largely facilitated by material properties, explicitly demonstrated in the previous section. A style, therefore, is something which is produced not necessarily automatically - it requires thought, effort and skill - but as a kind of side-effect of the successful reconciliation, and expression of a material's potential; of function and structure and of conformity with environmental, physical and cultural circumstances. It is worth asserting that style is not consciously aimed at, as many modern architects believe, but it grows 'naturally' like a plant according to a basic idea or fixed principles in the process of which the artist must have regard for tools, materials and physical climate, and in which the influence of time, place and culture, in its adaptive meaning, will also be felt. Style, hence, is the conformity of an art object with the circumstances of its origin and the conditions and circumstances of its development. This latter notion is a crucial one. Forms and styles are to be related to environmental conditions occurring at different points in time. They are consequently related to the social and cultural circumstances which are thought to be the natural products of adaptation to environment. Elsewhere we mentioned that the environmental conditions change between one historic date and another, so would the forms and styles. Finally, if we looked at style as an outcome of the intellectual climate of a culture, surely this climate should stem its spirit from a characteristic relationship to its specific environmental condition. In light of this notion an international style would seem but an expression of the degraded architectural realm of those who lend themselves to its absurd products.

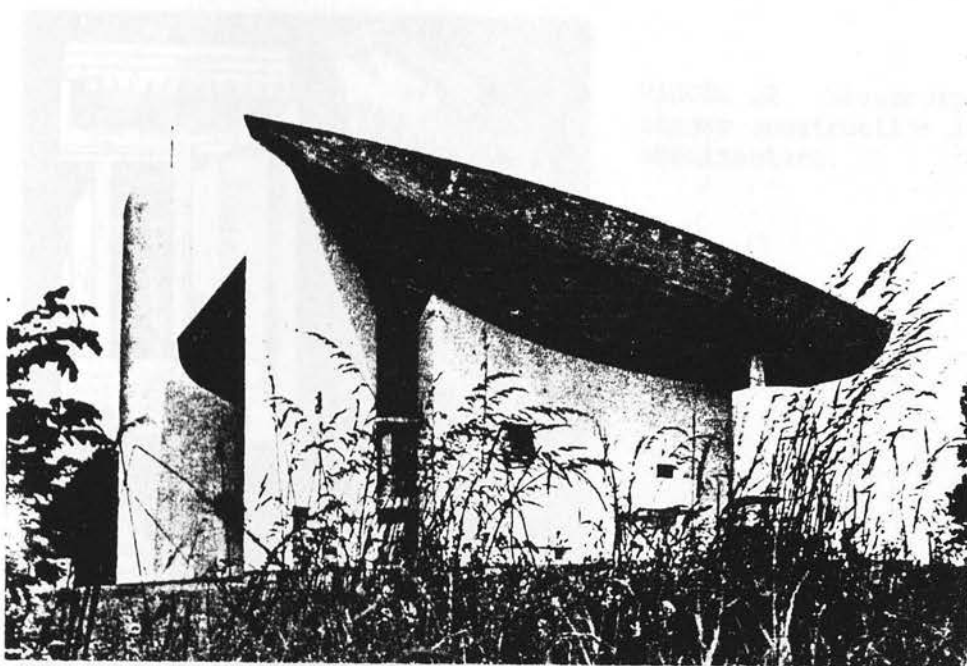


FIGURE 20 Le Corbusier: An imposed form which lends its idea to a mere abstraction in which nothing of a sense of detail can be necessary.



FIGURE 21 A house in Germany. The concept of discovered form. Each part is bound to the other in some relation of 'appropriateness' familiar to us because of the practical values of these parts.

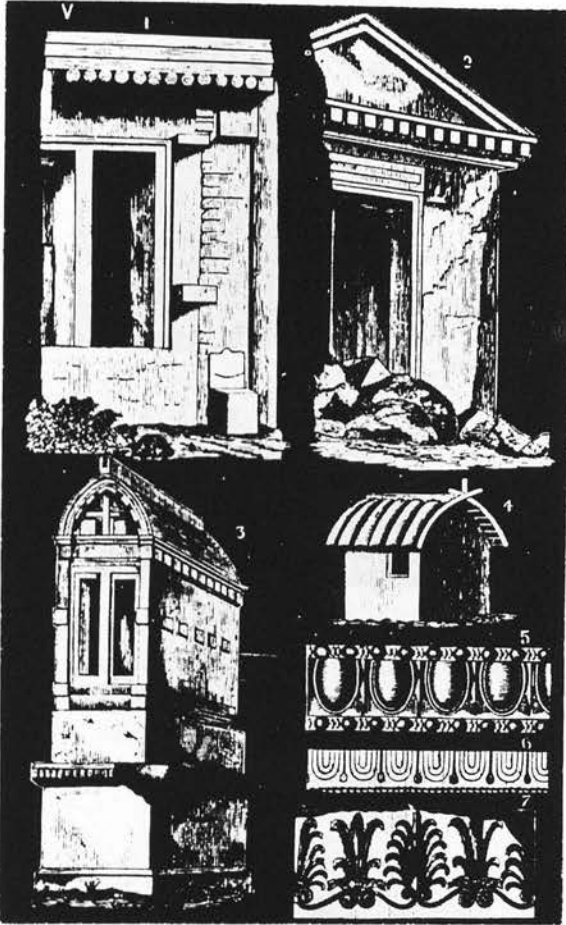


FIGURE 22 Skeuomorphs of timber construction in architecture.



FIGURE 23 Small house in Colinton, Edinburgh. Characteristics of timberwork are copied in stone.

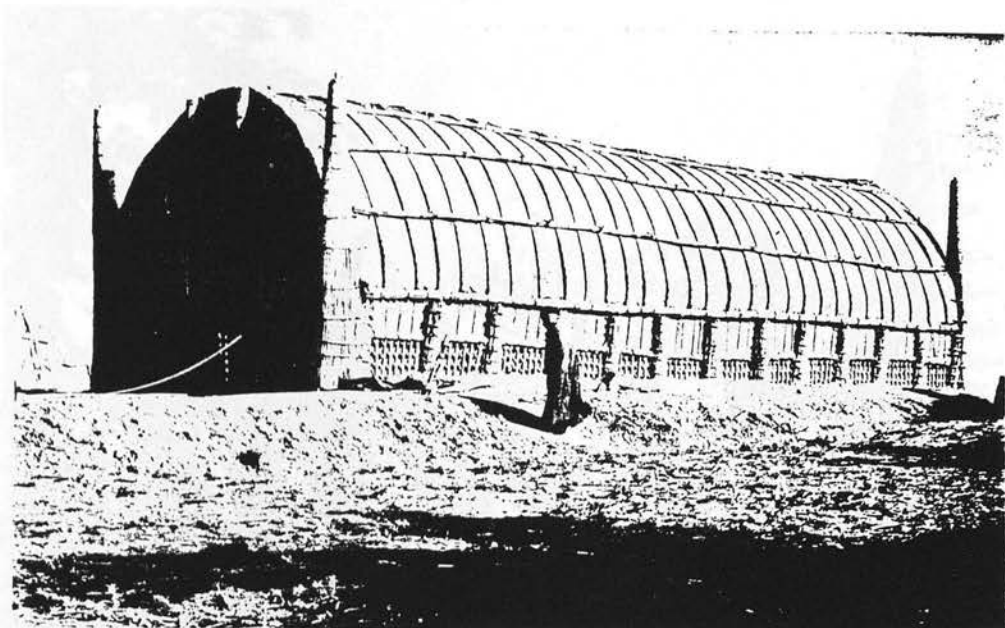


FIGURE 24 A reed house in the marsh area of Iraq. A full realisation of the reed's natural properties gives this form its aesthetic and design idea.



FIGURE 25 A typical Tyrolian timber house.

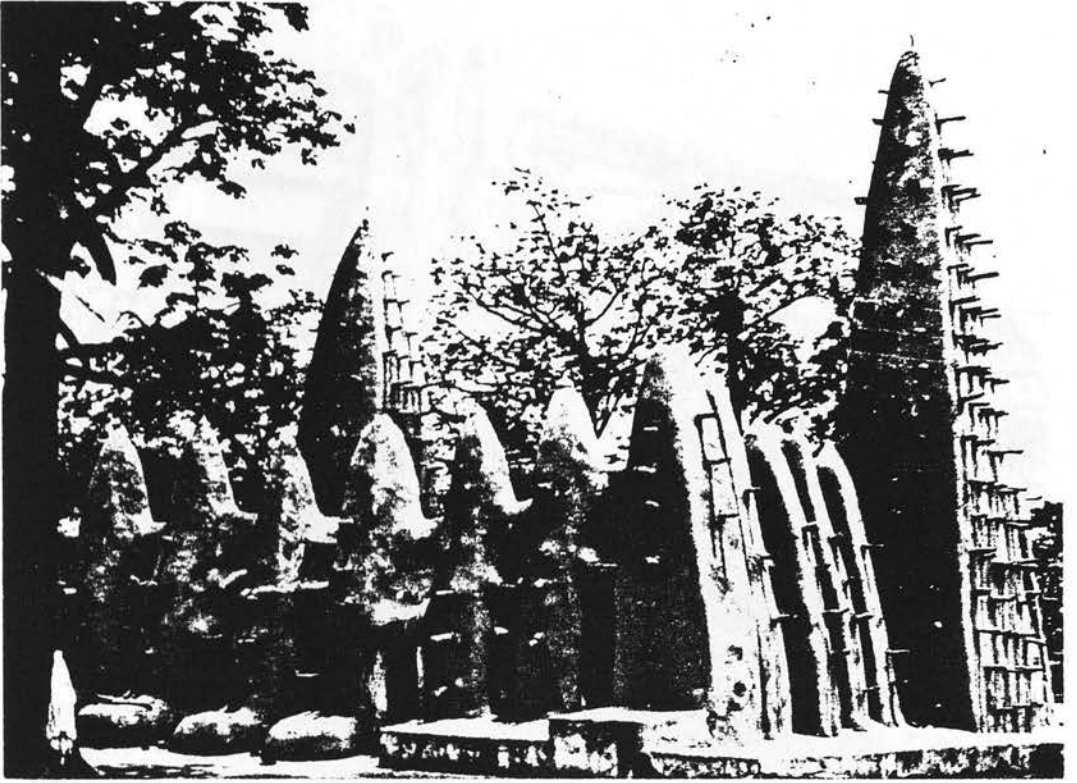


FIGURE 26 The great mosque at Bobo Dioulasso, Upper Volta, built of mud.



FIGURE 27 Town houses at Sana. Brick us used decoratively and details are emphasised in gypsum plaster.

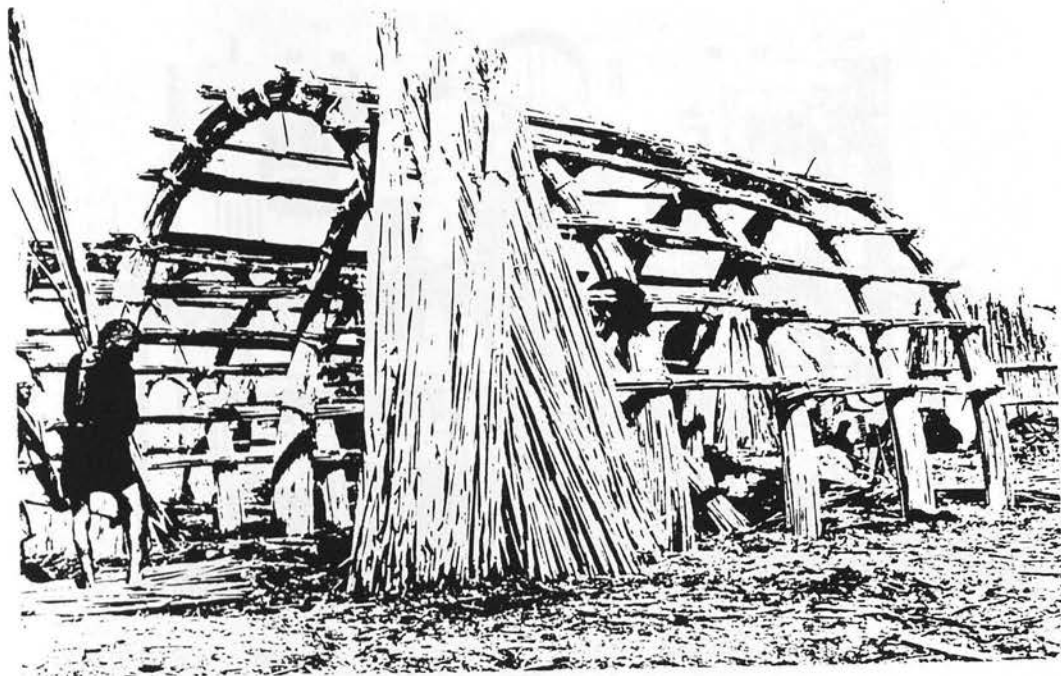


FIGURE 28 Reed bundles are inserted into the base mattress, brought together in an arch and tied with straw to hold them in tension.



FIGURE 29 Nakua: dome-shaped huts made of quarter-spheres of branches and grasses (Ethiopia).



FIGURE 30 Bab al Shaik development, Bagdad, 1981.
Decorative and purposeless arch.

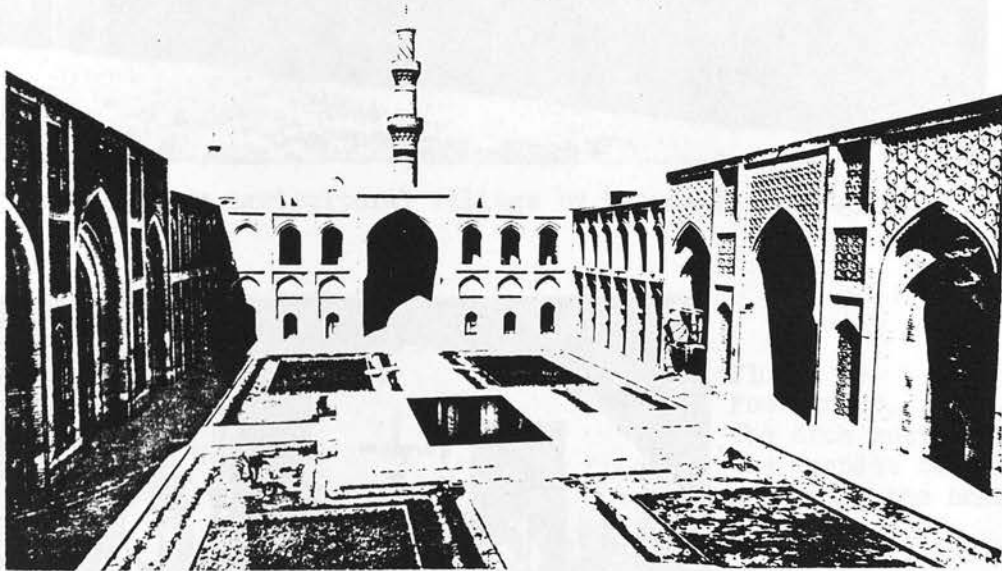


FIGURE 31 The Madrasa Al-Mustansiriyya in Bahdad.

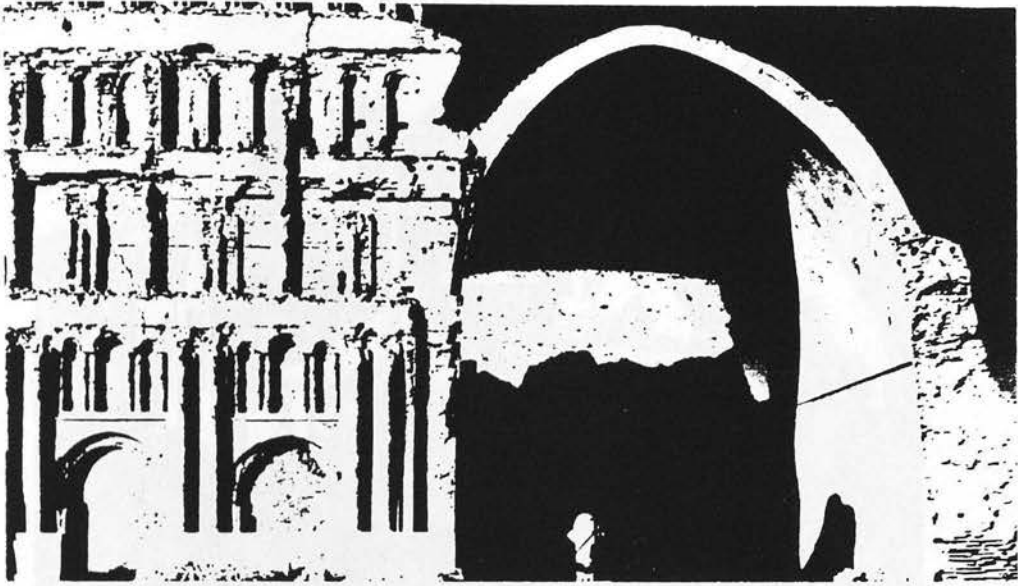


FIGURE 32 Arch of Al-Madain, Bagdad.

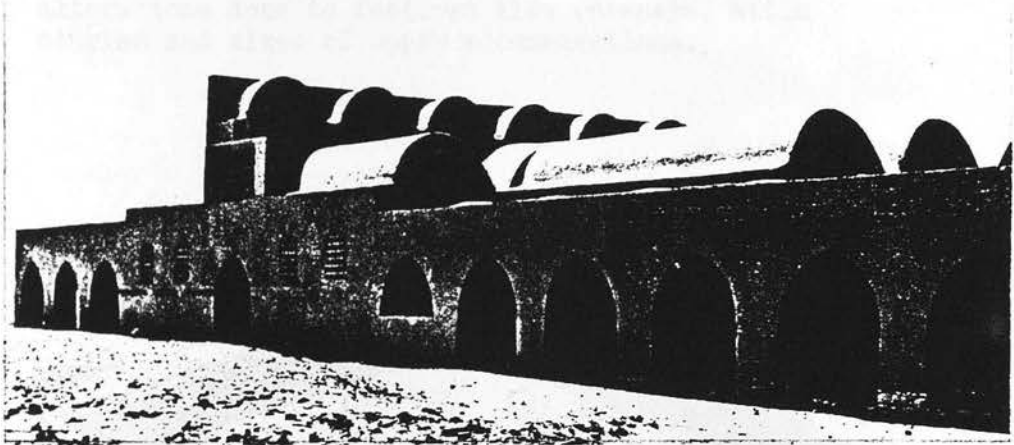


FIGURE 33 An agricultural village by Hassam Fathy, Egypt.



FIGURE 34
Postignano, Italy.
The arch motivates
the deepest cognitive
memory of the human
being.



FIGURE 35 Roofs differ from each other in minor alterations done to features like chimneys, attic stories and sizes of upper accommodations.



FIGURE 36 Low-pitched roof of the Alps.

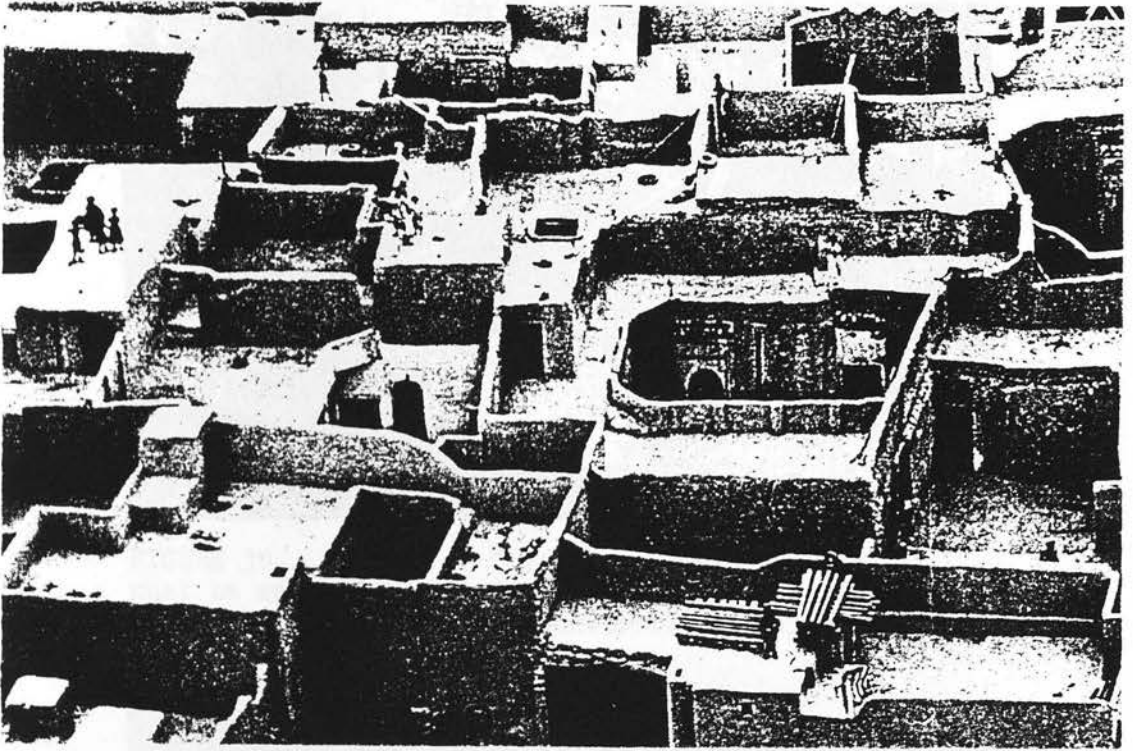


FIGURE 37 The flat roofs in the arid zone have their own functional and perceptual values.



FIGURE 38 A house in Botswana. In many instances the roof is so dominant that one may imagine the whole building has been projected from its roof, but not vice versa.



FIGURE 39 A house in Colinton, Edinburgh. Walls must be made of materials whose structural, thermal and visual properties are inherently familiar.

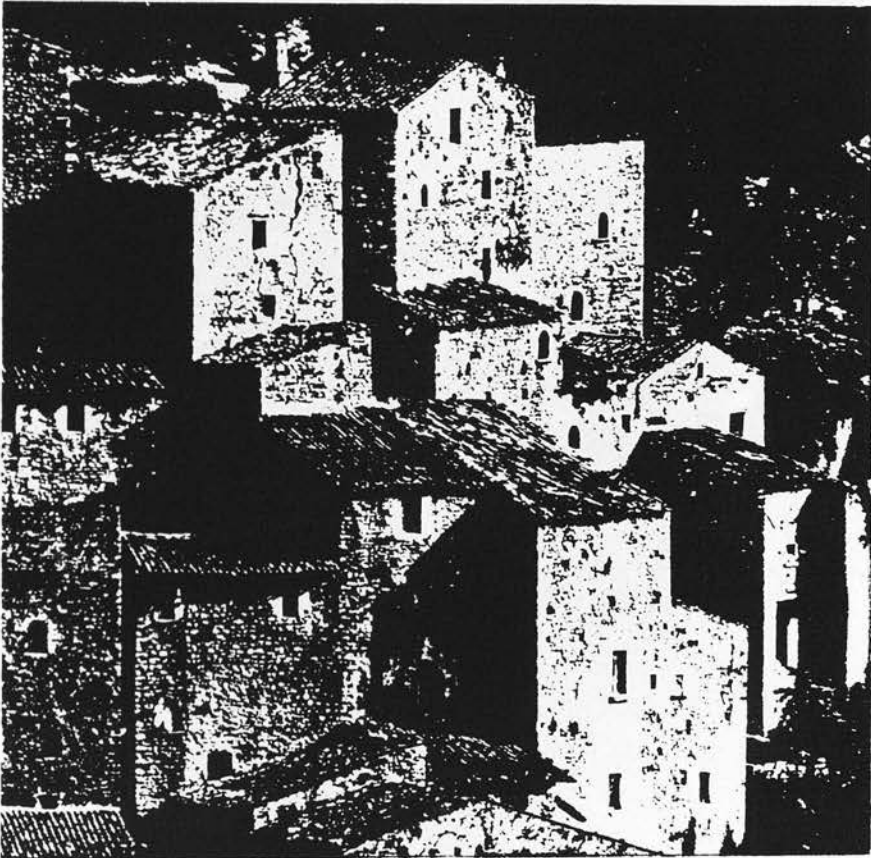


FIGURE 40 The village of Postignano, Italy. Our profound conception of wall is still that of rigidity, thickness and weight.



FIGURE 41 Piazzetta of San Marco. People experience relaxation, security, deep feelings of identity and belonging whenever they approach a column, even when it is used for non-structural purposes.

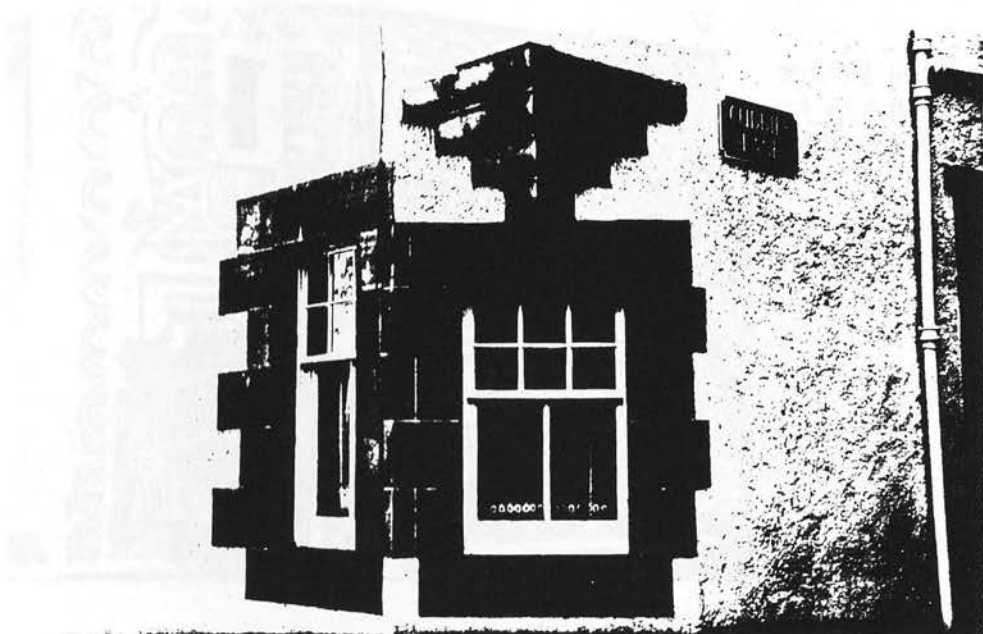


FIGURE 42 A house in the village of Colinton, Edinburgh. The form of a window is decided precisely to give the best effects of vision, light, ventilation and safety.



FIGURE 43 A modern 'glass' building in Edinburgh. We now produce buildings of window walls, so big that they blunt our sensitivity to the special value of light.

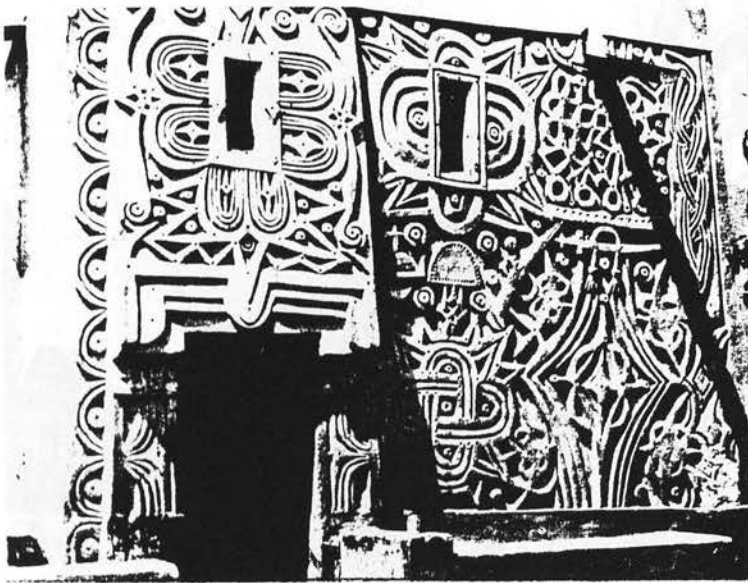


FIGURE 44 Ornaments to strengthen the surfaces of buildings.



FIGURE 45 Arrangements used mainly to prevent and conceal cracks, erosions and to enhance the structure.

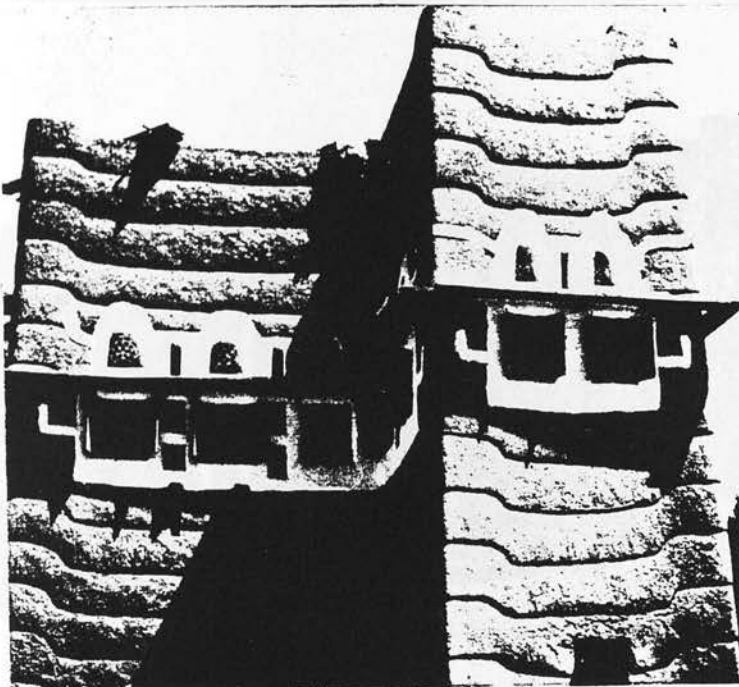


FIGURE 46 Increasing the moment of inertia is one major reason behind many decorative forms.



FIGURE 47 Auxiliary structural members function to enhance the architectural appearance.

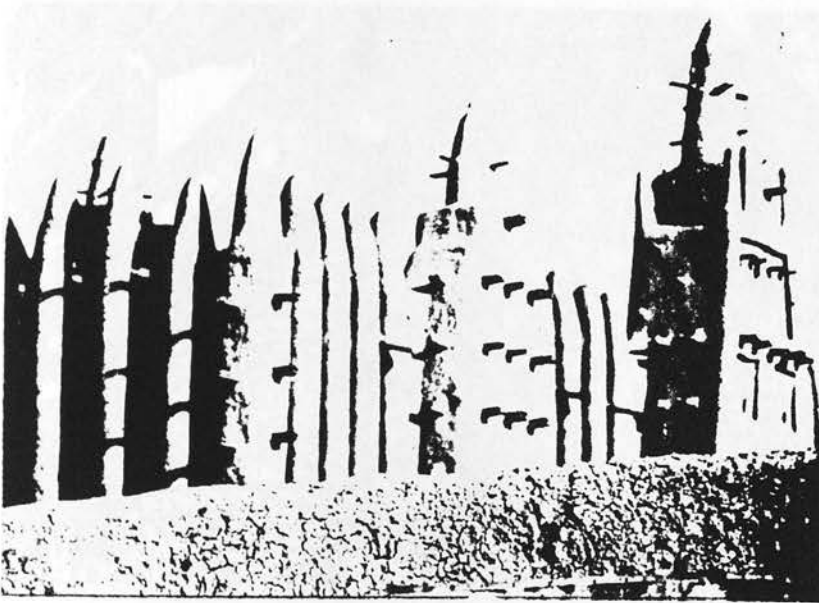


FIGURE 48 Recesses and buttresses are to strengthen high and tall walls.



FIGURE 49 Many Islamic buildings have been characterized by the use of recesses and buttresses.

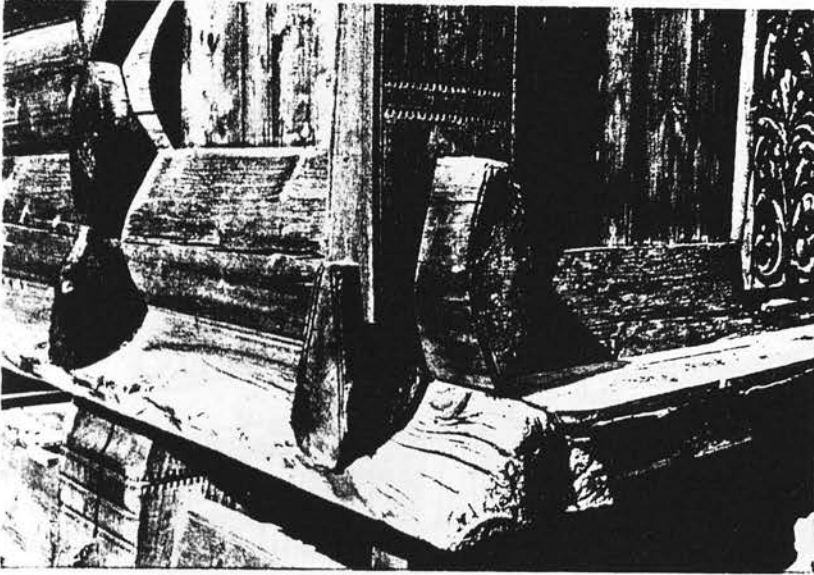


FIGURE 50
Featuristic treat-
ment of structural
joints.

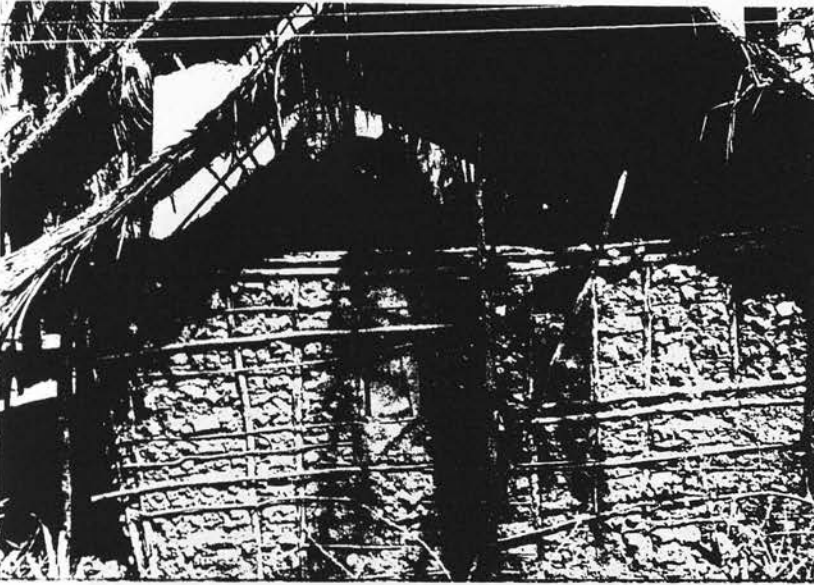


FIGURE 51
Arrangement to pre-
vent tortion, bend-
ing, deflection, etc.

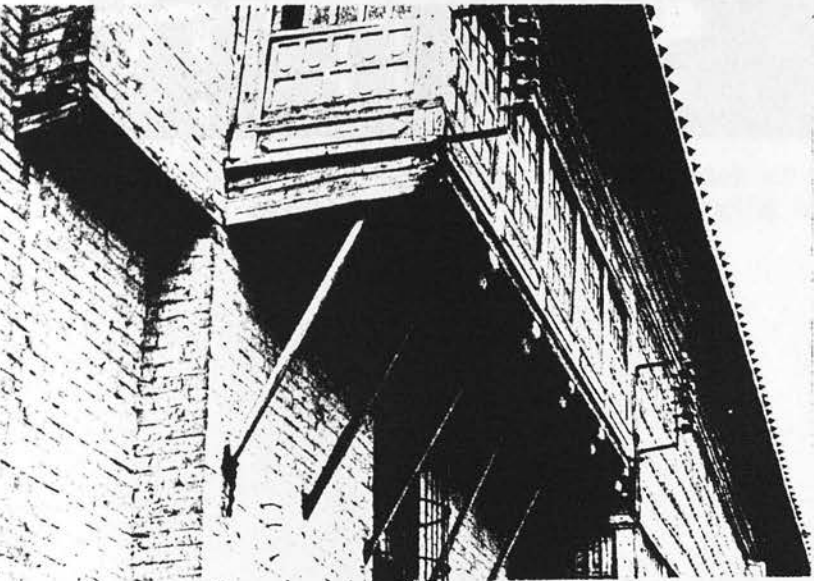


FIGURE 52
Better balance of
load achieved by
corbelling.

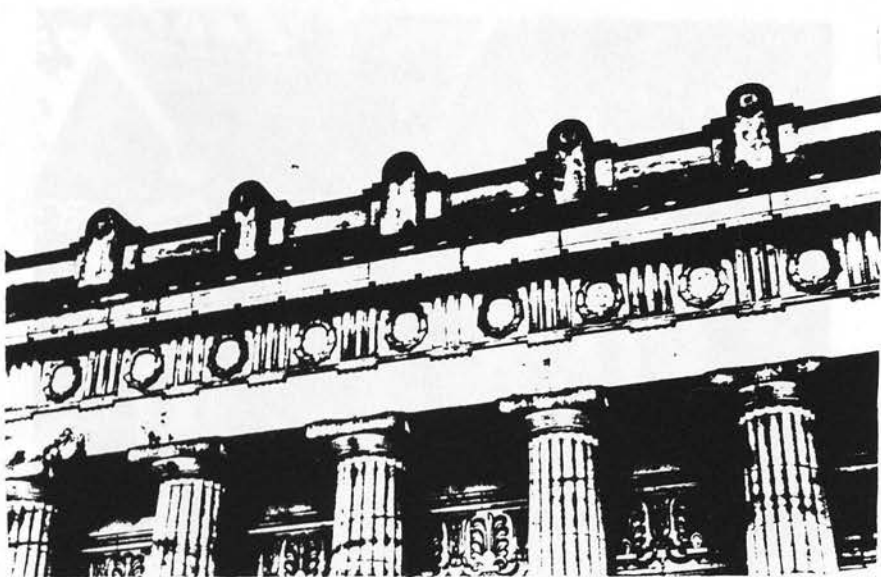


FIGURE 53 Load transition.



FIGURE 54 Wester Hails, Edinburgh. Lack of building treatment results in quick decline and aging of modern buildings.



FIGURE 55 Dormer windows to increase living space.

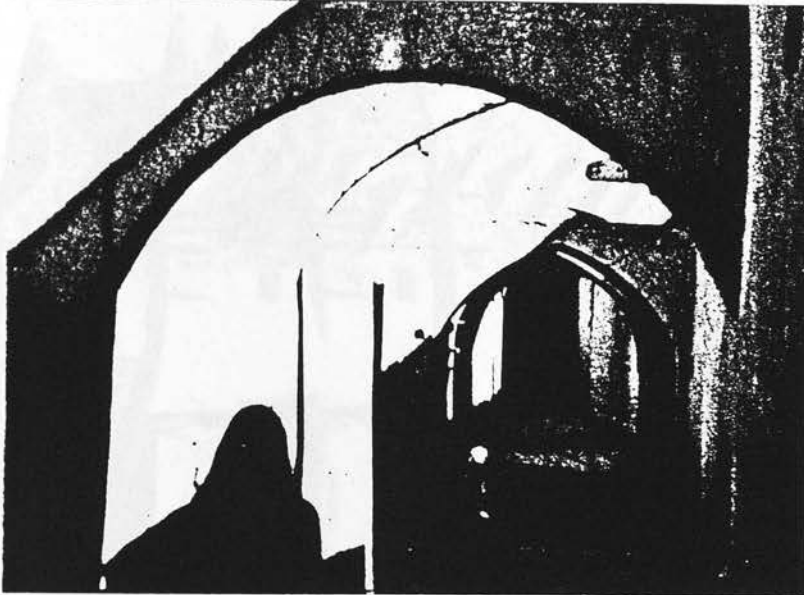


FIGURE 56 Shading and supporting devices, familiar in North Africa.

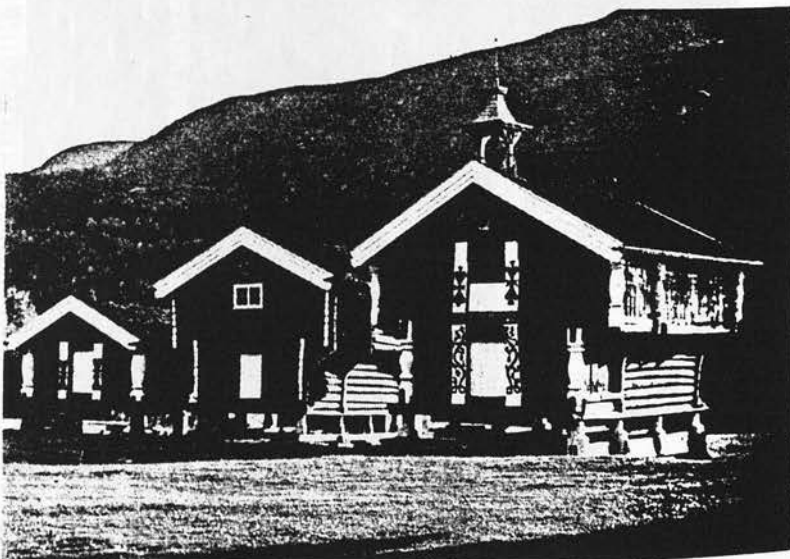


FIGURE 57 Raised houses for environmental reasons.



FIGURE 58 Air-catchers, house in Bagdad.

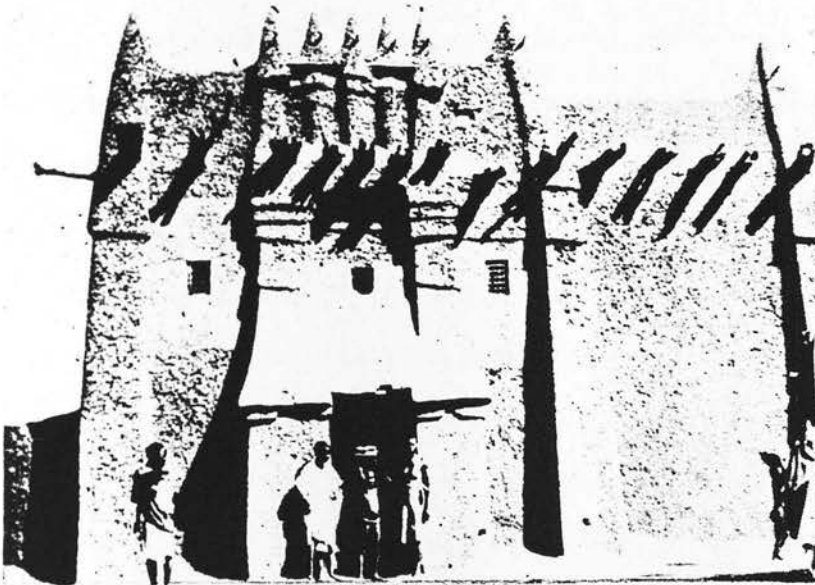


FIGURE 59 House entrance in Bandiagara, Mali.



FIGURE 60 Featureless buildings of today.

Chapter Eleven

11.1 INTRODUCTION

It is the purpose of this chapter to discuss the environmental components of the built environment.

ENVIRONMENTAL COMPONENTS

The Adaptive Aspects of the Built Environment

of, that provides a...

in a brick, or the...

of the environment...

is defined...

ENVIRONMENTAL COMPONENTS

11.1 AUTHENTICITY

It is the quality of an environmental phenomenon, a place, a landscape, a building, an element such as a wall or roof, a set of arrangements or, finally, a building material, in which one's true feeling is arisen because of an inside response to, and an immediate knowledge of, that phenomenon as being true, honest, appropriate, fitting and sincere. It is certain that such knowledge is not subjected to personal attitudes, nor is it motivated by one's emotions and past memories of that instance. It is a knowledge of the structure of that phenomena, whether in terms of the small constructive elements, such as a brick, or the spatial organisation which determines the distribution and extension of the phenomenon in space and which gives it its character. Authenticity suggests, as part of its specification, how natural materials look, how they can be shaped or articulated, or how they physically behave. It also predicts the totality of a phenomenon's structure: the endpoint where our thorough perception of the environment is achieved. Among the essential features of authenticity, most common and agreeable to many views, is that authenticity suggests a specific relationship between knowledge and action in which both seem to be somehow in correct correspondence (A. Wallis). In other words, what we know about an environment is confirmed both in immediate and long term consequences of the actions based on this knowledge. The inhabitants of a native village, for example, tend accordingly to act immediately and in long terms in response to their knowledge of the authentic properties of their settlement. They can predict the behaviour of the stone; its

visual, structural or thermal qualities. They also respond properly to the movement patterns and spatial structure reflected by putting together the various parts of their instance in accord with objective and empirical vocabulary of motives. These objects have, therefore, anonymous meanings which are established by the people as a whole following long processes of experience and also responding to cosmological knowledge which bonds people to natural substances (See Chapter 6). The individual knows that this is a brick wall or that is a wooden door. In the process of acting with such objects, the individual may have the opportunity to add new meaning, but he will retain its stereotypical identity. That is, the authenticity of an object is a judgement about the object in itself and it is prior to the reflection of the consciousness by which people approach that object. Clearly, then, an authentic conception of a building is not arrived at through social and sentimental interactions. On the contrary, authenticity of this building is the underlying element of social attitudes and social interaction. It is to a large extent responsible for shaping our intellectual perspectives with which we view the totality of the environment giving it subjective values.

It follows that it is not the designer's intention which gives buildings their character or endows them with aesthetic qualities; it is the authentic properties of the 'structure' of these buildings that a designer inspires and on which he builds his intentions. This latter point is extremely simple, straightforward and significant. It forms the central notion on which the study builds its judgement on the appropriateness of a design. We can certainly attribute the failure of many modern projects to a tendency of modern architects towards intentions that imply a good deal of abstraction and mental construction rather than being based on authentic and objective qualities of the constructive elements of the building (See FIGURE 61,62).

11.2 NATIVITY

The most fully recognised argument is that many places can be identified by certain features characteristic of their geographical settings. Among these are the igloo of the Eskimo, the reed hut of the marshes, the tower houses of Yemen, the traditional courtyard houses of Baghdad and many other forms which are in accord with their physical and cultural settings. It is, hence, geography that is manifest in a diversity of man-made forms and landscapes to which the notion of Nativity is strongly linked. Nativity, therefore, refers to authenticity of forms, features and activities in terms of their belonging to a specific context. It tends to reflect the total physical, social, aesthetic, spiritual and other features which are adaptive to each other and to their local culture. Among the most dominant features of a native settlement is, for instance, the widespread use of a local material. Accordingly, Nativity becomes manifest in the proper use of this material in setting up particular building arrangements and specific spatial structure and their consequent social milieu.

It is possible, then, that if people in a certain geographical area have particular characteristics related to their habitat, and if they have done certain things and chosen certain building materials for a very long time, then there must be a very good reason for it. Should changes of design ideas and variations in building forms then occur, it is certainly not for pure aesthetic reasons. This is equally valid in both primitive and more advanced societies. In the case of European architectural styles, stone, for instance, was persistently used for quite a long period of time. Each time the builder of a certain period discovers new quality in stone or develops a new method of construction, new characteristic

arrangements appear after which a new style occurs. It is certainly possible that with less choice of materials and more severe conditions of primitive societies, dependence on local resources is usually more persistent and a distinct character of the settlement is highly likely to be in evidence. Our example of building material is, in fact, just one example of many indigenous features which have similar significance. Certain economic activities or social habits have developed, in fact, in response to environmental requirements, and can be considered as indications or identifying elements of their native habitat.

The notion of Nativity is one of great importance in setting up appropriate design criteria within certain contexts. In this sense one possibility of applying arbitrary notions irrelevant to the environment in hand, is that it can result in drastic damage to the basic structure of the environment. That is, in many instances designers tend to disrupt the compatibility of environment by suggesting some changes in the design of dwellings or replacing local material though maintaining character resemblance. If such actions seem to be insignificant within the context of some modern societies, they certainly can imply considerable harm to less technological or native societies. It is worth noting that in a native society the various aspects that distinguish the society have developed compatibly; they are adapted to each other to such an extent that should one of these be interrupted the whole critical structure is threatened.

11.3 ENVIRONMENTAL COMPATIBILITY

The perceived state of equilibrium among the various components of an environment is evident in many natural societies (societies of strong links with nature). It is interesting to find, for instance, that an awareness of the pressure of population on resources is deeply embedded in the worldview of primitive people. Even pre-literate people invented their own way to control excessive increase in population (Devereux 1960). One remaining and widely known instance today is the way in which elderly or sick Eskimos commit suicide in order to reduce the society's claims on a limited food supply. However, the maximum size of population attained in certain habitats is determined by the physical capacity of its earth to support (self-reliantly) its inhabitants. By capacity we mean land area, availability of resources and economic possibilities, potential for food production, and ability of biological systems to absorb waste without a breakdown of natural laws. But on the other hand, a community living in a defined area can increase in population by developing new techniques. One possibility is achieved by using more fully existing resources, or by producing new resources. It can also be achieved by expanding the land, not necessarily by conquest as in the past, but also by increased trading.

At the present time there are many kinds of difficulties facing small societies in their attempts to achieve trading based on equal and mutual exchange of goods. In most instances much of the earning such societies make from exporting their local goods (mostly agricultural products) are absorbed by importing very expensive technology which might not be of any significance for the survival and flourishing of the society. Obviously it is beyond the capacity of many nations to compete with big and already established

industrial societies in achieving a balanced exchange of trading, a fact that normally brings about various social, political and economic conflicts such that it is difficult to estimate their drastic consequences. Among most known features caused by the importation of 'non locally developed technologies' is the ever increasing immigration of massive rural populations to the major cities.

It is worth knowing that should any component (economic, for instance) of a native environment be disrupted, a sequence of collapses may occur, hitting the rest of the interlocked components (social, behavioural, educational, political, etc.) with chaos, instability and conflict. That is, all these components, in fact, grow in such strong relationship to each other that one would seem the natural result of the other, drawing at the same time the cohesiveness and compatibility of their environment. It is extremely significant to maintain an optimal balance between population size and local physical capacity so that such a disruption can be avoided. It is also important to notice that such a balance, when achieved, not only restores the essential features of the environmental structure but draws every minor aspect of that environment. At this point we can begin to discuss further aspects of the consistency of place-population and illustrate its various implications in architecture and environmental phenomenon.

One popular view, mostly associated with modern theories of perception and widely applied in planning, is the segregation between indoor and outdoor domains of a settlement, according to which perception of environment is thought to be best achieved from outdoor space. Clearly, while this notion might be evident in some societies (e.g. the American), it is totally irrelevant in the majority of the

world's 'vernacular' societies. For instance, though inward oriented, the Arab traditional house achieved continuity with the external domains of the alleys or the quarter's streets and was always manifested in almost all levels! Visually, the same building materials, arrangements and finishings are used both inside and outside a house with no slight tendency to favour the indoors by adding more expensive finishings or interior decorations. In terms of activities, we may observe that many activities which usually take place outdoors can take place inside the house also. Some home-made goods, vegetables, food or drinks might be sold by the family from inside its house. We might find a group of neighbours gathering in one house playing a game or setting a social ceremony at certain times. Women behave quite similarly in both domains. A woman inside her own house would not show up when having visitors, though they are her closest relatives she is hardly to be seen behaving differently at any place or time. The outdoors, therefore, does not exist for many Arab groups, only in drawing ways of communal movement and passing by. The same argument is true for many of the Italian hill-towns. It is rather difficult to decide that an alley in these towns is really an outdoor place. It is certain that a distinction can't easily be made between what is seen to be an outdoor or an indoor place in so many areas of the world, to such extent that the notion of external perception of the environment would seem but an irrelevant theme. And yet this is perhaps one aspect which strongly demonstrates our notion of environmental compatibility and which is threatened by new economic patterns being injected into many existing native environments and thus changing their authentic structure and breaking down their compatibility.

11.4 ENVIRONMENTAL SCALE

It appears almost obvious that when architects talk of scale they most likely mean the size ranges of 'isolated' buildings or their various parts. Unfortunately, we are still accustomed to speaking of architectural scale only within the very limited and narrow domain of building facades or sizes of some architectural elements such as the window, the wall, etc. The perspective required for understanding the real scale that should concern us is one of a broader nature. It extends beyond the domain of single buildings and certainly involves the totality of environmental phenomena. Scale has to be understood as the physical size ranges within which all visible objects - buildings, landscapes, spaces, articulations and textures of materials, extent and intensity of human activity structure in an environment - are perceived. It will, certainly, help to point out that there is no one universal principle that may be applied in deciding types and sizes of these visible objects that may go beyond their local determinants. In other words, these size ranges are adaptively confined not to universal or pure aesthetic aspects but to local and objective considerations of which climate and building materials are significantly important. There are many instances in which scale appears to acquire extended meaning. It is very common that there are in each society some characteristics of social, economic or physical natures that would be disturbed should the size of spaces, height of buildings or movement patterns change for one reason or another. The size of an outdoor public place in an arid zone, for example, is determined by the extent to which the surrounding houses allow sufficient protection from sun heat. There is no doubt that many activities take place when appropriate physical grounds in a settlement are provided. On the

other hand, heights of buildings in many instances are the manifestation of various elements of which structural capacity of materials and thermal comfort requirements are primary. It is interesting to note that the tradition of planting certain kinds of trees in the arid areas is largely based on the amount of shade their sizes provide (See FIGURES 63, 34, 65).

One can, in fact, bring about many examples in which scale is shown to imply a quite significant role in restoring the lifestyle of a certain group of people. For instance, as soon as the Arabs move from their compact traditional quarters to the new open housing developments, a drastic decline in their social activities and interactional opportunities occurs. The tendency of modern planners and architects towards bulky and tall buildings, wide streets, huge parks and extended public places has in fact set up many environmental inconveniences for many native societies. Many of these groups have suffered a passion towards appreciating what is a big, dominant and very often featureless mass of structures.

A few brief remarks which explain further components of environmental scale may be necessary. In addition to the requirements to meet thermal comfort and protection against variations in climate, is that the type and size of many architectural and structural arrangements are essentially determined by the innate qualities of natural materials (See Chapter 10). Naturally, this includes, besides these arrangements, material texture, pavement patterns and decorations whose scale is significant in setting the environmental perception.

People act to each other in accord with their psychology and the cognitive images of their environment. The Arabs, for example, maintain close spatial distance during their interaction. They talk to each other so closely that one hears their breathing and smells

their body odours. Their perception of distances and spaces are differentiated from others due to compact living conditions.

Among the reasons for rejecting vertical developments in some countries is availability of land for both agriculture and urban sprawl. In contrast, those countries which lack land or undergo excessive population increase, such as Japan, have a growing tendency towards high rise buildings. But it is true that living in lower single dwellings is a tradition which was built over hundreds of decades and has its roots deeply embeded in history. Such tradition should not be threatened by increasing demands on land or by excessive technology and its consequent phenomenon of immigration.

The principal meaning this article conveys is that environmental scale implies great significance in drawing the social, economic and ideological communication network which affects the members of a society and involves all the physical objects of the environment in hand.

11.5 COHERENT SPATIAL STRUCTURE

Like a plant which grows from a seed, the emerging settlement achieves its evolution by growing and progressively developing its form. By evolution we mean, as Spencer puts it, 'a change from a state of relatively indefinite, incoherent, homogeneity to a state of relatively definite, coherent, heterogeneity'. Spencer makes a distinction between growth and development. By growth he referred to simple increase in bulk; by development, an increase in structure, or a progressive differentiation and form. While these notions have been initially used in Biology and Sociology, from a close examination we will find that these processes are displayed widely in many environmental instances. It is possible to make such an analogy in design as long as evolution is a process manifested, not just in organic nature, but in the material world too, and not only in plants and animals, but in man, society and culture (H Spencer 1855). Accordingly, therefore, one might firmly state that environmental forms are not invented; they are developed, as natural forms are developed by evolution. During the evolution of a settlement there exists a continued interaction between the settlement and its environment til it becomes progressively more complex and more differentiated. The further the differentiation and specialisation of function within a settlement, which is achieved by introducing building of different functions, the further the increase in the functional interdependence between the various parts of the settlement, creating what might be called coherence of the parts. From this notion developed the idea that the function of every part has similar qualities to the function of the whole.

Along with the progressive development of the settlement develops man's cognitive familiarity through furthering and intensifying

interaction with ever changing events of the environment. It follows that each part of the form acquires its cognitive representation as a result or expression of its performance of more specific and distinct functions. This functional coherence is always perceived through the flow of spaces as a reflection of the complexity and performances of the form. If there is any validity in the suggestion that environmental quality is best perceived from outside, it is only because its spatial structure implies great importance in expressing the coherence and functional performance of the various parts of it. A space is, hence, an essential part of the environmental form. It is an inseparable and coherent element whose flow very often maintains the continuity of the solid mass and represents its purposefulness and meaning.

We are brought now gradually to the point where we can suggest with certainty that it is hardly possible to perceive vernacular towns as being composed of spaces and buildings. Most likely we perceive them as a whole of integrated and coherent parts. It is only very recently, when modern architecture has already destroyed the concept of space, that literature on the space as an absolute and isolated entity has been increasingly introduced. The most that could be expected in this situation, in my view, is either one of two suggestions. First, attention is often now given separately to each individual building with almost no consideration to continuity with its surrounding context. Second, in designing any modern development, the designer usually starts with determining the roads and movement networks whose orientations, sizes, destinations and patterns follow, in most cases, an arbitrary design thought. The designer then fills in the blanks with an unintegrated mass of buildings. The fact that many modern developments tend to widen

the gap between what is perceived as a void and what is perceived as mass is the logical outcome of achieving the design idea on the drawing board, just in the same way the design of a machine is achieved. In fact, public places and spaces no longer develop. They are just invented, formally and intentionally, to accommodate activities imagined by the designer and involve a smaller number of people than the designer usually expects. The result, as one may predict, is that spaces function to break down the coherence and plasticity (if it exists) of the settlement. In contrast, spaces in vernacular towns (e.g. the hilltowns of Italy, France and Spain, and the Arab towns, etc.) are developed along with the evolution of the town structure and hence mark its consistency and coherence. A space, then, is just an enlarged 'cell' among the many differentiated cells of a whole. Its emphasis on the unity and coherence of the structure of the town is manifested in the cell having a distinct external wall surface as if they were in tension. In most cases these walls normally consist of well articulated buildings of different functions and whose facades have received more attention. The implication of this is usually the flow of activities as well as people, so as to mark the liveliness and consistency of the whole cells of the town (See FIGURE 66, 67).

11.6 CONTINUITY

There is perceived difficulty in picking up clear meaning of this term in the literature of architecture. The most frequently occurring use of continuity refers to consistency, plasticity, unity and flow of form which includes both space and mass of buildings. More specific fields of Anthropology, Psychology and the science of knowledge would refer to continuity as the flow or transmission of knowledge from one generation to another through cultural communication and genetic links, and trace the implication of this on the establishment of the environment's specific and persistent character.

Steadman suggests, for instance, that "in the production of many artefacts, especially in the craft or vernacular traditions, one object is very often copied in its design (perhaps with minor differences) from another". According to Steadman the fact of copying gives rise to a continuity in form and appearance, when the genetic links are followed between a series of artefacts successively copied, each from the last. The characteristic form of the artefact (e.g. a building) may witness a slow transformation due to small modifications introduced at various stages. "The fact of many similar artefacts being thus produced with related but not identical forms (and functions) results in the appearance of what may be termed 'populations' of objects, amongst which it may be possible to identify 'types' according to either functional or morphological criteria."

It appears, as an implication of Steadman's arguments, that the evolution of building form undergoes a series of successive copying with slight modifications that a builder introduces through his task as mainly the communication of building experience. Continuity then, is achieved as a result of this transmission and flow

of thoughts, in spite of the differences in the function and visual appearance of buildings. We might say that what underlies the discontinuity and desert-like quality of modern environment is a lack of flow of architectural understanding from one generation of architects to another. Instead, there exists a conflict of various contradictory and individual interpretations of building activity which can hardly go beyond the designer's own emotions, reflections or vocabulary of personal tendencies. A modern designer is a prisoner of his own empty aestheticism by his own will. He would respond to the history and heritage of architectural knowledge as a legacy of thoughts of past times but not as an enduring fact, a permanent part of an extended present.

11.7 SPONTANEITY

There is nothing more enduring and eventful than the quality of spontaneity in the vernacular traditions. It is a harmful feature of much modern architecture that it lacks this flavour. Indeed, modern environments exert intolerable stress on people due to the intentional and pretentious thoughts that it imposes on people not regarding their communal attitudes and every day feelings. Serious and intentional buildings seem to demand untouched spaces and approaches, and imply formality that burdens people's perception of their own environment, regulates their movements and determines their behaviour. It is not only the building itself that matters, but the whole site, and the site itself is often forced into unnatural regularities or filled out with geometrical 'boxes' which leave unpleasant voids of spaces, rugs of pavements, ugly projections of walls and roofs or meaningless play of levels. However, in contrast, vernacular designers are so often admired for the changes they induce in the townscape, its various spaces and the slight variation in building forms. They tend also to invest a slight quality or property of the site by placing their buildings in any corner, curved way or empty and irregular plot of land. The changes in building form, shape or scale are arrived at through the management of building details and the practical necessities of meeting climatic requirements or putting together various parts of the building. One may be able to actually approach a genuine aesthetic quality through a sense of reality practically displayed by irregular and uncontrolled environmental phenomena.

11.8 HOMEOSTASIS AND ENVIRONMENTAL ADJUSTABILITY

All aspects of an environment can be shown to work on self-regulating principles. Homeostasis, a concept first developed by Walter B. Cannon, expresses the capacity of the body for regulating its internal state, for maintaining its physiological stability, in the face of disturbances coming from the external environment. The most popular example of stability is the constant body temperature maintained by warm-blooded animals through very large changes in air temperature. A familiar interpretation of this kind of regulatory system in architecture is the thermostatic control of a central heating plant (P. Steadman 1979).

We can, of course, examine how environmental capacity to change in the same way is achieved. In vernacular architecture, the main task of the user or builder is to recognise defects - evident functional failures of the building or any of its various parts. The vernacular builder reacts to these defects by changing them, but is unlikely to impose any 'designed' conception on the form. 'Disturbances' come to the building from the changing environment; these are the cause of the misfits or failures in the design which the user recognises. He acts to correct them by making some alteration in the form of the building.

The whole system of building or dwelling, human agent and environment is, in this situation, self-regulating, self-correcting. It displays the property of homeostasis which is hardly to be displayed in many modern situations. One of the best examples that I can cite here is the reed settlements of the marshes area of southern Iraq. In summer where both temperature and humidity are expected to be very high, people of the marshes usually make openings in the reed walls of their hut to allow air to enter and hence

modify the inner temperature. In winter they close these openings by adding more loose reed to the external face of the walls and light fires inside the hut so as to return the temperature to the required level. These slight modifications in the form of the reed hut are to resist small and frequent disturbances caused by weather changes from one season to another, and perhaps from one hour to another. In fact, people of the marshes live on artificial islands which they build by accumulating a mixture of reed and animal dung. This mixture has a sponge-like quality which allows the island to move up and down following the water level. Faced with the ever increasing flood levels caused by lack of cleaning on the marsh bottom, they add more of this mixture regularly so as to raise the island ground surface to escape the water. They often build new and higher huts in the island to accommodate themselves as well as their animals during the flood seasons. Here is a kind of adjustment to resist long term disturbances which take place as significant modification in the main form of the dwelling, of which the island is an essential part.

To summarize then, the reaction of the marshes inhabitants to correct 'misfits' arising as a result of environmental changes can be to make either of two types of change to the dwelling (the hut and the island). The first is a short-term one, like making openings or closing them. The second is a structural change over the longer term, which takes place usually by modifying the island or building a new, copied version of a slightly modified hut.

A second instance which displays the same capacity of self-regulation is the phenomenon of mixed uses. In vernacular environments, it would be quite familiar to see new shops being opened within the residential areas whenever the need for them arises. In most circumstances these environments would also allow the daily

markets to occupy any part of the settlement at any time without causing any disturbances to the occupants.

There are a number of specific cases offered here, one of which is adaptability to an ever-changing situation such as the increase in family size; a popular example in many traditional societies. It is important to realise that the phenomenon of expanded family is one of great economic implication rather than a mere social habit. Such phenomenon is certainly accommodated, as we may know, by the ability of the dwelling to accept modification so as to house the newly married son and his wife as well as any number of new-born children. On the other hand it is hardly possible to find any traditional form that would not take any alteration or improvement desired to suit its occupants' changing taste. These kinds of properties are, however, rarely displayed by the new forms, especially concerning acceptability of renovation. The old traditional buildings would soon acquire new appearances, and can often easily accommodate all the requirements of the modern lifestyle, with little modification.

11.9 SELF-CONSCIOUS DESIGN AND ENVIRONMENTAL ADAPTABILITY

It is certain that some preconceived designs, which seem to have an artificial flavour, might imply no paradox to the ecological notion of organic growth. Those planned towns such as New York, Barcelona or the Bastille towns of France, or those which are built on artificial sites like Venice, are in fact instances where organic growth is best observed. It is true that organic growth is conceived to basically underly the unself-conscious designs of the vernacular traditions (C. Alexander 1964). It does not necessarily imply that all self-conscious designs are artificial misfits or inappropriate to their physical or cultural environment. However, Alexander's distinction of the self-conscious and unself-conscious designs is not an issue that may be taken for granted or resolved easily or decisively. It is difficult to assess the acceptability or fitness of a design on the basis of whether it was a product of self-conscious or unself-conscious thought. We cannot assume that all thoughtful solutions are by nature artificial and hence inadequate, nor can we assume that to think self-consciously means to employ concepts of any kind.

What we are confronted by is not, no doubt, a thoughtful idea which is developed within its specific context, but by these universal concepts which are sweeping the indigenous and specific characteristics of the world's environments. It seems, then, that we cannot reject the inadequacy of such self-conscious or thoughtful designs at the expense of relegating human intellectual capacities. Artificiality is not the employment of thoughts but the employment of elements and thoughts which are exotic to the native habitat.

We can best examine this notion by reference to the planned towns we have already mentioned as well as the 'new town' in

Edinburgh (See FIGURE 60). It is quite obvious that these towns have succeeded and have not excluded the possibility of organic development. Moreover, they have not prevented the growth of those overlapping patterns of human activity. L. Martin and L. March have argued that the notion that elaborate patterns of living can never develop within a preconceived and artificial framework is entirely false (Martin & March). They put their argument in a different way, that is, 'an organic growth, without the structuring element of some kind of framework, is chaos'. But they go further when asserting that it is only through understanding this structuring framework that we can open up the range of choices and opportunities for future development.

It could be possible then to put the argument in this way. Many towns grew up organically by accretion, others, just as flourishing, were established with a preconceived framework as a basis. The whole pattern of social behaviour has been elaborated within a limited number of arrangements (grid of streets, plots, building arrangements), and this is true of the organic as well as the constructed town. According to Martin and March, the choice of the grid allows different patterns of living to develop and different choices to be elaborated upon. The grid, unlike the fixed visual image, can accept and respond to growth and change. It can be developed unimaginatively and monotonously, or with great freedom. The striking moment is when the original grid fails to respond to new demands and it is at this point that we must try to discover from the old framework a new ordering principle that will open up new opportunities for elaboration by use. Such is obviously a true argument. The successive stages of the new town in Edinburgh, for example, have largely been based on its preconceived pattern. And here, the overlapping activities and their intensities are one of the most

distinctive features among almost all European towns. It is almost entirely true that in spite of the major difference in layout between the old and the new town in Edinburgh, the only perceived difference is a slight change in the building facades that even an instructed eye would not discover without an act of intention. If we went back for a while to examine the relevancy of the various aspects we have already presented in this chapter, it would appear that, accordingly, both areas of Edinburgh appeal to them and hence there exists no possibility of regarding the new town's design as inadequate or misfit as Alexander may argue.



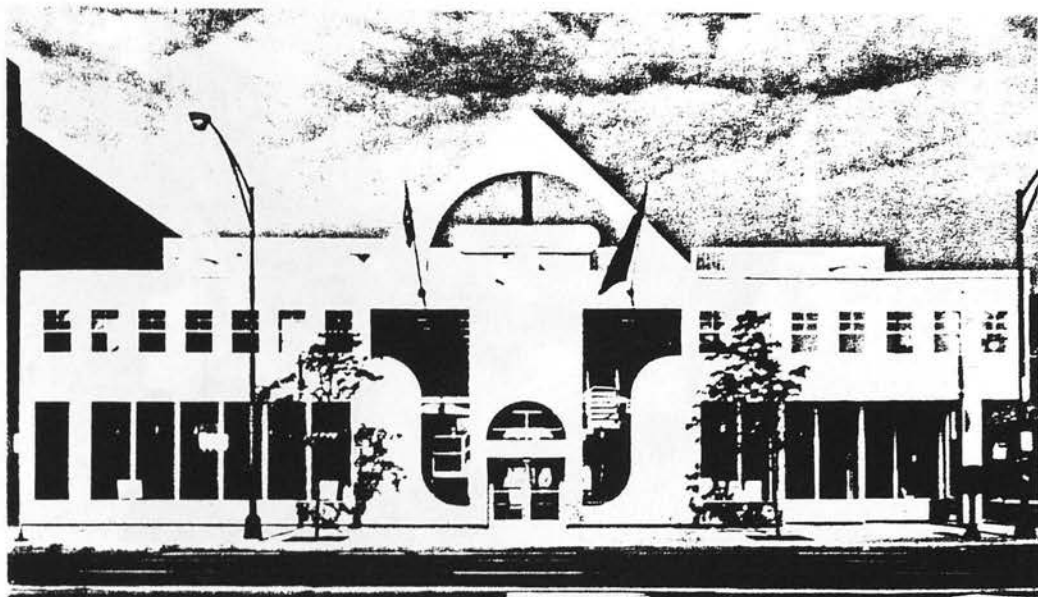


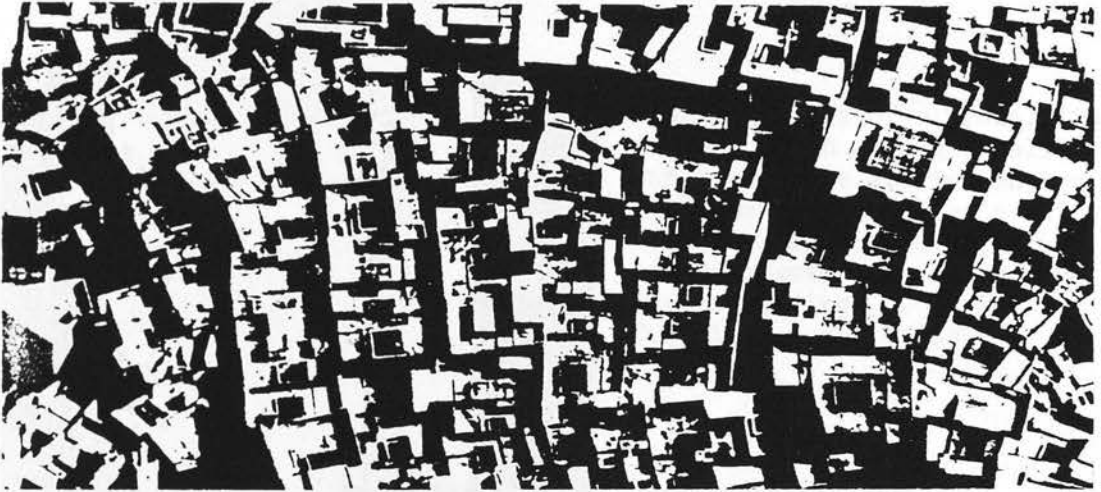
FIGURE 61 Building of the Anti-Cruelty Society, U.S.A.



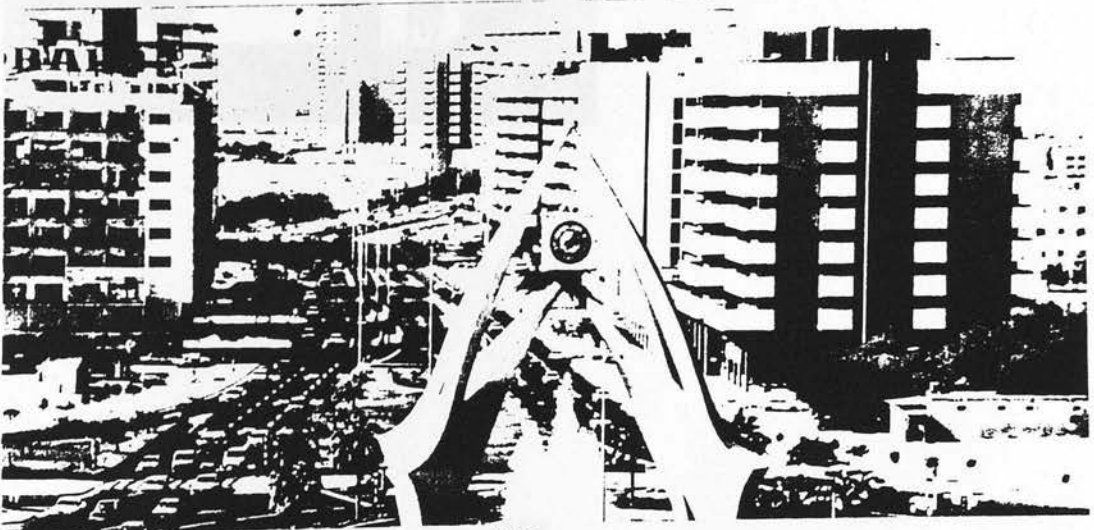
FIGURE 62 New building at Heriot-Watt University.
A tendency towards intentions imply abstraction and
mental construction characteristic of modern architecture.



FIGURE 63 Height of buildings and sizes of their various elements are to provide thermal comfort within the limits of structural properties of local materials.



FIGURES 64 and 65 An Arab traditional city has an image largely associated with prevailing low buildings and narrow alleys to meet environmental conditions and their consequent social context. This image is, at present, destroyed by buildings and open spaces of monstrous scale which usually exist 'everywhere'.





FIGURES 66 and 67 Siena, Italy. A space is an enlarged cell whose external walls are in tension. It emphasizes the town's unity and coherence by having this wall composed of well articulated buildings of various functions and facades.



FIGURE 68 The eternal beauty of Edinburgh is manifest in the adaptive characteristics of its morphology, building materials and coherent styles of the historical buildings. The only perceivable difference between the old and the new town in Edinburgh is slight modification in building facades; the whole town is still very distinctive for its coherence and unity.

CONCLUSION

The broad scope and communicative nature of this study would make it of no perceived limit or end. The conclusion here does not aim at forwarding a conclusive theory out of the various assumptions or concepts of the study in hand. A tendency to formalise an approach contradicts, to some extent, the initial motives of rejecting abstract theorisation which replaced the activity of the art of building. It was nevertheless suggested that recalling the central themes may help to concretize a solid assimilation of the objectives behind this study.

It is apparent that 'Design' is increasingly and seriously becoming interrupted, even though it is virtually a phenomenon which has its roots profoundly extended in time and the history of humankind. It certainly glorifies man's affiliation with his land, his society and his own home. It certainly symbolises his attitude towards his natural habitat to which he owes his thoughts, beliefs, rituals and most of all his values and his culture. Architecture painfully is now becoming more and more associated with manufacturing ideas and with a growing tendency to entertain people with abstract themes, exotic and admittedly alien even to the people of the same culture of designers themselves. While it was difficult, if not virtually rather impossible to distinguish between a building and its design ideas, architects of today are predominantly confronted with a struggle between the building as seen in terms of its materials, architectural details or structural arrangements, and the arguments which claim to underly its design. Among the messages

this thesis is intended to convey was that according to field observation and relevant studies, design cannot, in a moment, be manufactured or invented. Design, indeed, is the product of history. It evolved through tremendous efforts on the part of many generations of designers, builders, craftsmen, artists and people who used and modified their creations. Therefore, the study firmly suggests that design idea is THERE and all that designers have to do in fact is just pick it up and adapt it to its new context. This would suggest that designers need to have particularly well trained and instructed eyes to be able to diagnose the idea, distinguish it among many 'things' in our lives and most importantly relate it to its indigenous habitat. Here we arrive precisely at the main and central philosophy that this study has contributed; 'Ecology of Architecture'.

The study argued that it is very difficult to arrive at any assessment of the environmental quality beyond the influence of the values and meanings people usually establish in the process of the adaptation to their native environment or more broadly their ecology. Ecology according to the study includes, besides the physical conditions, the whole set of beliefs, values, norms, customary behaviours and lifestyle all in accord with the specific effects of that setting. To clarify this notion we may need to use some examples cross-culturally. It is known that the Arabs, the Muslims and those who inhabit the Arid zones would respond to the colour green in a way totally different to those who inhabit the temperate regions where greeneries, forests and vegetation are the everyday scene. People of the Arid zone attach meaning and holiness to the colour. In fact, they wrap the holy book of the Quran

with a green piece of cloth. They cover the dead bodies of the important persons with green carpet and so on. The plausible reason is that where they live lacks the green colour of the forests, vegetation, trees, etc. Therefore, it is highly true that these people would respond to any green object not as a mere physical object but as a value. Another example is the way the Iraqi people respond to the brick. It is believed that people of Mesopotamia started the making of brick some seven thousand years ago. They shaped their built environment out of this material. Bricks provide them with optimal thermal comfort. It is the material responsible for the compactness of their towns, hence for intensifying their social interactions and enriching their social life. The whole set of physical and behavioural properties of this material and the variety of architectural forms and their aesthetical capacities, have been perceptively transformed into a profound set of values that are embedded in their cognitive structure and which are unfamiliar to the inhabitants of other countries. It is, therefore, unacceptable to deal with environmental quality without a framework of this kind. We have been constantly introduced to architectural works in which the building is no more no less than the mere physical properties of its various components. There could often be little room for these values and representative meanings that people preserve about their native buildings and which constituted their perception of the whole built environment. Moreover, there is always a lack of understanding of the fact that people of various habitats approach the same physical object with a tremendous variety of interpretations and perceptions. A major intended contribution of this work has been a setting of a perspective about environmental quality based on meeting people's schematic

values which includes the physical objects, events, situations and also the whole network of interrelationships among objects, events and situations

It was argued that due to some kind of forces of cosmological nature and due to living and adapting to a certain ecology, people establish and promote their cultural context. Culture is a vital and very crucial theme to be considered in architectural and environmental design research. With bringing in the significant implication of the three elements of Ecology, culture and cognition, the study builds up its essential view that people's behaviour and creative achievements are to be seen as the outcome result of the adaptive interaction between these three elements.

1. Ecology:

It is defined as the study of the interactions that determine the distribution and abundance of people. People settle in a place which possesses certain qualities and resources. They shape and adapt their living so as to conform with the specifics of this setting. It is possible sometimes to draw an accurate boundary line between one culture and another, when there is a sudden change in the soil, topography and climate. The significance of this element does not only lie in the study of its influences on people's lifestyle but also, and most importantly, in the role it plays in differentiating various societies from each other.

There seems to be great validity in the idea that assessing a society's preferences, particularly in architecture can be best achieved by studying the impact of the various components of ecology on shaping that society's

physical and cultural environments.

2. Culture:

The passion for technology and the international style has resulted in many architectural schools ignoring the notion of culture and cultural differentiation. It is a pity that those who felt the bitterness of ignoring culture in design have advocated an alien and harmful interpretation for this very vital concept. They have considered culture as an intellectual capacity that all human brains are credited with and which is inherited biologically from certain points in history. Such a stimulating view has its serious implication because it ignores any role for Ecology in shaping and differentiating one culture from another. The study has adopted the view of the school of cultural ecology in which it is suggested that culture is the set of norms, beliefs, customs, rituals, lifestyle, social institutions etc, set up in accordance with the physical environment. Culture is considered here as a valuable source of information which is transmitted and communicated from one generation to another. It enables the new generation to live and cope successfully with its environment so that a threat to its survival can be reduced to a large extent by internal forces. The study has benefited from the anthropological concept of cultural core suggested by J. Steward^d and has interpreted it in architecture. A cultural core is the constellation of activities and features strongly related to subsistence levels such as basic economy and natural resources, interpretation of nature or religion, climate and so-on. In the process of adaptation to these subsistence conditions, a society sets up its prototypical patterns in architecture, social structure, and behavioural forms. A culture then

promotes features and activities which are more sophisticated. Other features move towards abstraction of highly aesthetical dimensions remote from the core of the culture in hand. It has been suggested that to arrive at appropriate solutions more fitting and responding to their people, designers have to advocate solutions more relevant to specifics of the cultural core. It is rather dangerous to entertain abstraction in architecture for reasons related to the difficulty of distinguishing, identifying, and ascribing the features to their authentic habitat, a condition which brings with it alienation, chaos and loss of identity.

3. Cognitive structure:

We learn to live, adjust our behaviour, build our knowledge of the world depending not on recorded sources of information only rather on communal knowledge we inherit from our ancestors. The cultural data are copied and transmitted through certain patterns of actions and behaviour that our neural system functions to pick and store. Such knowledge comes from both the physical stimuli as well as from our past experiences. The function of cognitive structure is to collect data, process them and store them in the form of symbols and schematic images. Both the biological and cultural structures which evolve and acquire their characteristics from living and adapting environmental circumstances, work to influence the processing of knowledge and hence shaping our behaviour and responses to various stimuli. The author believes, therefore, that our choices, perceptions, preferences are to be seen as strongly complementary to the whole processes of interaction between the biological and cultural structures and the images we store about the environment. For example, we store a certain image or

or meaning about a column, a situation, a structural relationship, a brick wall thickness, etc. If we encountered the word 'Bird' the likely bird to envisage is a pigeon rather than a penguin or ostrich. It is this kind of schematic structure that determines our perception of what is more fitting, satisfactory and appreciated forms of building, behaviour and situation. The likely explanation to this is that in the processes of our biological and cultural evolution, the likely mechanism in which we build our knowledge of the world is that of creating cognitive prototypes. These help to identify the objects by categorizing them into a set of mental fragments. It is thought here that in each Ecology (physical and cultural setting) certain types of behaviour and built architectural patterns are most expected to prevail at all times.

The study defines the task of designers as the search and the implementation of these schematic representations and cognitive values specific to the habitat to which design is meant to pertain. To arrive at appropriate understanding of aspects such as economics, demography, planning issues, architectural solutions and so on, the study has suggested that we need to build an approach based on interpreting the cognitive data first of all. There is a scientific theme to back such suggestions. As man forms part of a universal system, and as his neural structure evolved in response to the various ecosystems that control the universe, schematic data should represent optimal and most stable situations that man has been exposed to through his evolution.

The application of this approach within architecture is that we ought to produce design ideas in which the various elements, techniques and building arrangements maintain, as highly as possible, the schematic values people usually accumulated and which induce a sudden familiarity to the designs in hand.

To illustrate the interaction between Ecology, culture and cognition, the study has elaborated its own Model. The importance of this model lies in the way it assists in the achievement of architectural and cultural identity which is vital within the notion of Regionalism. However, it should not be understood that this approach imposes limitations on design ideas or confines buildings to imitation and copying from the past. We have maintained that the cognitive structure is in a process of continuous but slow change following piecemeal changes in nature and ecological environment. We reject rapid changes brought about by high speed technology which go beyond human capacities to absorb and adapt biologically or culturally. The consequences of the involvement in such a situation have been introduced in the first two chapters quite explicitly. The study has suggested, instead, that certain principles, largely of a practical nature, underly the various aspects of the built environment. These principles are the potential constructs of ever-occurring innovations as they are for any desirable alterations which can fit ever evolving circumstances.

Let us assume, for example, that a country lacks the presence of historical buildings, traditional or old buildings. Let us assume also that another country has been exposed to many invaders who have imposed

their own values or traditions or swept away the native culture. How is it possible, one may ask, to identify those principles which are supposed to pertain to the social and cultural aspects of these particular countries? Before answering this question let us remember the brutal destruction of the old towns and the traditional areas which is taking place at present in many unfortunate countries. In fact, the bitterness and pain that are brought about by this 'organised killing' of history cannot certainly find consolation in the monstrous schemes that usually replace the old traditional quarters. What actually happens is that a mature knowledge, a recorded history and a free and most popular source of cultural and environmental data, accumulated over centuries of hard work is precisely sacrificed to irrelevant and cheap alternatives of the international current.

Nevertheless we are not pessimistic. Whether a country loses its tradition or has its culture challenged by external pressures, only those behavioural and architectural forms, consciously planned or otherwise, which correspond to their ecological setting are expected to survive. In fact in answering the previous question, we re-emphasise the role various environmental factors specifically those related to the core, in drawing the proper cultural structures of that society. In fact it was decided that any of the three levels of human evolution: ecology, culture, and cognition, can provide us with clues for our investigation. It is obvious that we would expect to face some difficulties if we start our investigation from the element of cognition. Cognitive values are highly sophisticated and include a complicated, ambiguous, and latent set of features, customs, desires, attitudes, interpretations, sentiments, unconscious responses and so on.

On the other hand less effort is made to investigate within the cultural environment. Observations into the social structure and habits, the various artifacts, fashions, social behaviour, architectural forms and patterns and other cultural features, are practically feasible, but have to consider the relation of these features to their ecological setting: But at all times there can be found a straightforward and unmistakable access towards restoring a culture by studying the exact impact of the various physical and ecological factors on its various phases particularly the core stage. It is also extremely important to consider that each environment has its own unique structure in which the various components, climate, topography, population, resources, religion, etc are interrelated. The study argued that it is only by studying the history of any aspect that would enable us to locate any phenomena in its proper place in the environmental structure. For example, the social phenomena has its implications most determined by other components in the environment such as temperature, local materials and topography, as it is in the case of the Arab towns as well as the Italian hill towns.

Having argued that it is these three elements of ecology, culture and cognition in harmonious interaction which credit the built environment with its various capacities and potentials, the study suggests that to arrive at a proper assessment to the nature of designs and strategies, a full comprehension of the main physical conditions is a prior necessity. It should be stressed again that any attempt to incorporate values more related to the sophisticated cultural features will inevitably lead to serious consequences. One simple reason behind this statement, apart from field observations, is that such

an attempt implies difficulties that architects of today are unable to come to terms with. Admittedly architectural forms are best perceived within their cultural and aesthetic dimensions, but they are also best conceived in terms of their practical relation to climate, construction, material potentials and so on. We shall conclude this issue by suggesting that what seems to be mere decorative and aesthetic forms are in fact practically derived arrangements. They are to enhance structural, thermal or physical performances of the building. Many other features are initially to resist external stresses and to function climatically and have acquired their social and aesthetic properties following a schematic process which transmitted these physical arrangements into mental symbols.

We now should try to find out how such understanding as a whole can be communicated. It is rather impossible to suggest that we have to educate everyone towards restoring their schematic values. This is due to the challenging international forces; economical, political, technological, mass diffusion of dominant fashions, which have interrupted people's knowledge and perception of their own native culture. Alternatively, architects have a pioneer role at the present time, in designing and controlling the quality of our towns hence affecting people's preferences and taste. It is the responsibility of the architectural institutions to redefine the architect's role in his society. It is required from the architectural institutions that they reconsider their teaching programmes in which interest in the mere technical aspects of the building have been predominant. A building is a record of a society; its history; its culture; its tradition and most significantly its ecological and physical conditions. It is required from these schools that they stop producing, for example, architects who, going back

**ACKNOWLEDGEMENT TO EDINBURGH AND
HER SON P. GEDDES**

Arriving in Edinburgh six years ago, I was deeply depressed by the overwhelming blackness and old age of her buildings. It is so surprising that I am, at present, madly sad and deeply depressed at the idea of leaving her one day. For more than three years I have entertained a growing passion to build my architectural and environmental knowledge from living and observing this city. Edinburgh is of an entirely eternal beauty that no other city in the world shares. Her unique character, the impressive harmony of her buildings with their natural settings and every renewed diversity have all contributed to the enrichment and the development of my concern with ecology and architecture. It will certainly take more than I imagine to record my admiration and love to her. But, I will certainly better express my debt to Edinburgh by exploring the tremendous lessons one can draw through a study that I wish to carry out in the near future.

It was during the writing of the thesis conclusion when I felt a great desire to show my gratitude by acknowledging Edinburgh's great son Patrick Geddes..

At the centre of Geddes theories is his belief in the spirit or soul of a city. Determined by the various social and economic networks as well as the actual building, by the known past and the possible future as well as the present, and by mechanical environmental influences as well as psychological forces, each city's spirit differentiates it from

all other cities. Planners try to create some kind of order which will allow large numbers of individuals to inhabit limited space without causing too much friction. Generally, they attempt to solve the problem of apparent chaos by creating their own patterns and imposing them on the city, thereby creating at least an artificial appearance of order. Geddes had a different view. He refused to design such a pattern. With his biological knowledge he understood the idea of an organic order that is not created by human beings. Just as no scientist can create life, no city planner can create a living city. To reduce its complicated networks to a pattern designed by the limited human mind would be to kill the city, since much of its vitality comes from the diversity and multiplicity that the human eye sees as chaos.

Geddes suggested that all the diverse activities which we see as confusion - the random meetings of many people, the simultaneous operation of numerous unrelated industries, the thousands of vehicles running every which way - actually form part of a cohesive pattern, although it may be too complicated for us to perceive at once. The pattern that Geddes wished to discern is unique to each city, not representative of a general mould into which all cities fit. Because he believed that every city has an individual soul, he insisted that each must be planned individually, with its specific characteristics in mind. In refusing to create a generally applicable urban ideal, Geddes differed markedly from the Utopian planners who preceded him. Geddes criticised such plans for binding all cities to a single, limited pattern which bears no relation to the specific character of each city. Since he

believed that living cities must grow organically rather than conform to a rigid plan, he opposed "those town planners who design a shell, and then pack their snail of a would-be progressive city into it, not discerning that the only real well-fitting shell is that which the creature at its growing periods throws out from its own life! Thus Geddes focused on existing towns and made no suggestions about building new ones. In his view, a planner must receive the impetus for a plan from the particular spirit of an individual city, and an open piece of land has no such spirit. The deductive approach used by the Utopians characterizes the ground planning method which Geddes criticised. The problem with such plans is that the design has almost nothing to do with the lives led by the majority of the people in the city. Geddes had the same objections to the standardized grid-iron street patterns that dominate the industrial cities. These were considered by him as anti-human because they try to force the naturally complex urban functions into a completely regular form. Even though a geometric plan may look good on paper, it almost always harms the city more than it improves it. In order to put such a plan into effect, the city administrators often have to destroy numerous shops and homes that lie in the way of the ground avenues and monumental buildings projected by the planners. Geddes argued that since a planner cannot possibly control every aspect of his plan's execution, and since he cannot preserve the completed plan unchanged by succeeding generations, planners then, should not even try to create a single perfect work. A city planner is not like a painter or a sculptor who can create a work of art in its final form, instead, the planner must take into account the people who will use and change the city with time. The city

cannot and should not be the expression of a single person's artistic abilities.

To remain true to its own spirit, it must express the activities and desires of all the people who have ever lived in it.

Certainly, it is beyond the capacity of this acknowledgement to present a full and comprehensive review of Geddes's invaluable contributions within the field of planning. In fact his holistic views have generally set the framework of many contemporary insights within the environmental sciences. Today, these views are appealing, and most certainly are required to understand the complexities of urban and environmental problems. I found it compelling to study this great man and acknowledge him as a founder figure for modern environmental sciences. For him and my beloved city of Edinburgh I record my unreserved gratitude and admiration.

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