

THE BUILT ENVIRONMENT, COGNITION AND THE IMAGE:

Towards an Architectural Epistemology

Thesis for the Degree of Master of Architecture

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January, 1980

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Introduction

1.1. MOTIVATION

Man is increasingly assuming conscious control over his physical environment. The impact of rapidly accelerating scientific and technological progress has resulted in the environment being increasingly man-made and man-influenced. The growing urban population has necessitated building at a rate and quantity greater than ever before. Enormous resources, both human and material, are being channelled on an unprecedented scale into the planning, designing and construction of new environments for human use.

Whilst this tide of energy and activity continues to surge forward, creating vast urban and suburban developments, very little energy and resources have, by comparison, been directed towards critically assessing the impact that these built environments have on people, and the extent to which they are responsive to human needs and aspirations. It has become critical for the architect to be made fully aware of the human implications of the physical environment he is creating.

Concern for the human element has been eclipsed by the current pre-occupation of the design profession with technology and economics which have become the dominant design imperatives. Environmental problems are interpreted in terms of a narrowly defined scientific rationality instead of a

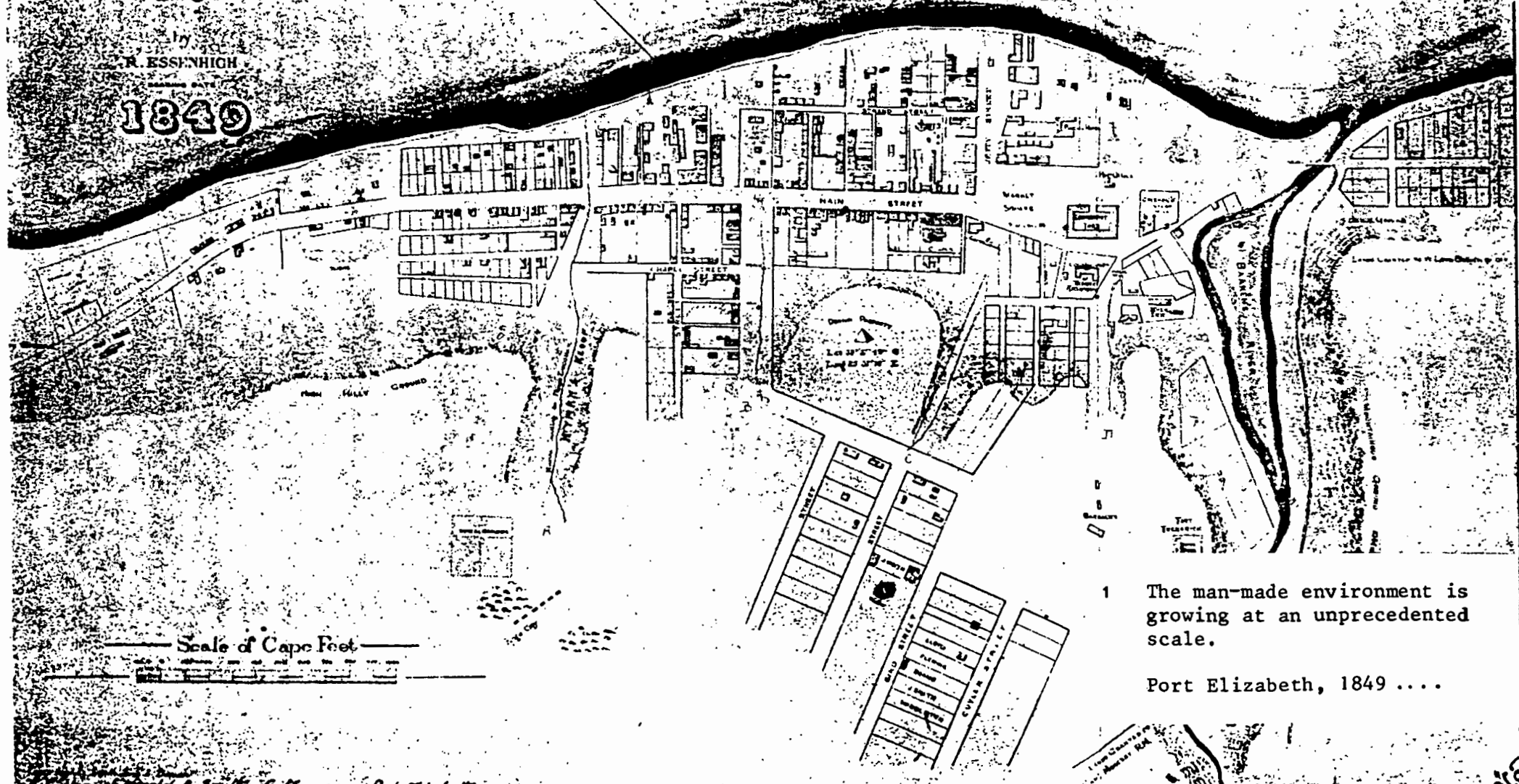
PLAN

OF THE TOWN
OF
Port Elizabeth
SOUTH AFRICA
FROM A SURVEY

by
R. ESSENHIGH

1849

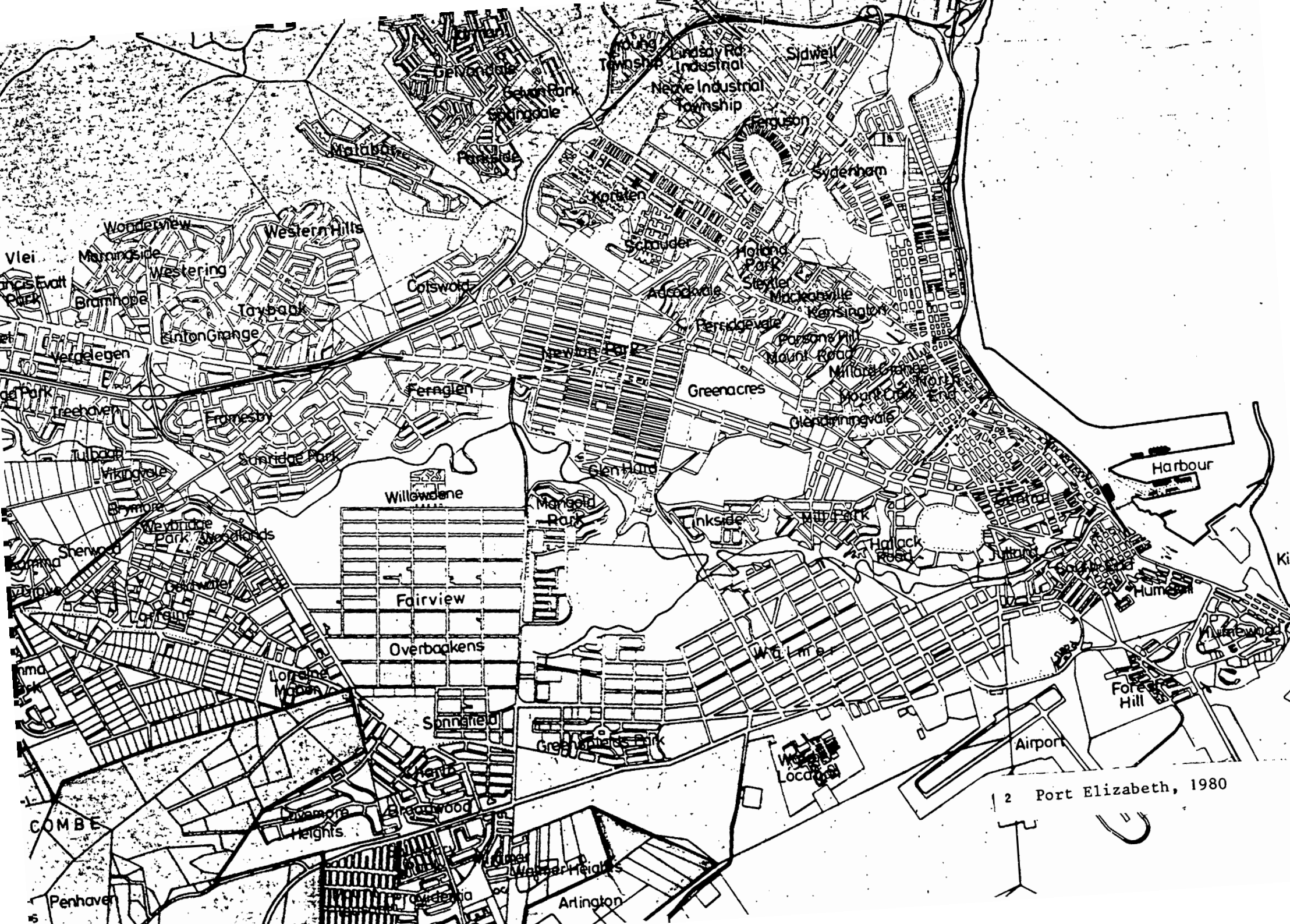
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Scale of Cape Feet

1 The man-made environment is growing at an unprecedented scale.

Port Elizabeth, 1849



2 Port Elizabeth, 1980



socially responsible and humane rationality. (Burnett-Prinsloo & Prinsloo, 1978, p.12).

Much attention is focused on the structure itself - the cost of construction, the integrity of the materials, the technical performance and method of construction, the physical layout and harmony with the site - with relatively little in-depth analysis of human needs and aspirations. The architectural press shows evidence of the profession's lack of real concern for the people who will occupy and use the buildings which it produces. The photographs in architectural journals usually show empty rooms and circulation spaces. Furniture is formally arranged but no indication is given of how the building is actually used by people.

The idea that architecture has human implications is not new. Planners and architects have long been aware that the form and appearance of buildings are related to social and psychological factors. The interplay between man and his environment has been observed by architectural historians, who have shown that man's structures in every era and in every land reflect, and are an expression of his personal, social and cultural context. However, only in relatively recent years, has there been a systematic attempt to investigate the relationship between man and his physical environment.

In the last three decades there has been growing concern (amongst laymen and professionals) about the quality of the built environment and its impact on human life. It has been heightened by instances in which housing projects and institutional structures which have been highly praised by the architectural profession have proved not viable as healthy living environments. The high rise Pruitt-Igoe housing scheme in St. Louis, Missouri, which won an award from the American Institute of Architects when it was designed by Yamasaki in 1951, provides a good example of this. A section of this scheme had eventually to be demolished by dynamite in 1972 since it supported a crime rate higher than any other development and was continuously vandalized.

Psychologists, sociologists, human geographers and a growing number of architects have been brought together as a consequence, to undertake research into the complex relationship between human behaviour, feelings, attitudes and preferences, and the built environment. This relatively new field of enquiry is generally referred to as "man-environment studies".

The field of environmental cognition has developed as a sub-section of man-environment studies and as such, shares the same ultimate goal of understanding the relations between man and his physical environment. Two fundamental assumptions are generally made by researchers working in this



3 Pruitt-Igoe public housing scheme.
Built in the 1950's, part of it
had to be dynamited less than 20
years later.

field: firstly, that what is known and believed about a particular environment, that is, how that environment is "seen", influences human behaviour, preferences and attitudes with regard to that environment and, secondly, that an understanding of this knowledge and belief base which underlies individual and group action, needs and desires is essential if planning and architectural practice is to be at all effective in contributing to an improved quality of human life. (Moore and Golledge, 1976, p.xi; Downs and Stea, 1977, pp.12, 241-246). Basil Honikman (1976a) articulates the need for an understanding of environmental cognition if architects are to play a positive role in society.

The question of quality of life is of particular importance. I believe that the major (and perhaps only) justification for the profession of architecture is that it should contribute to the quality of life by improving the quality of the physical environment. Without understanding the meanings people give to environments, it is very difficult to know what constitutes "improvement" or "quality". (p.98)

1.2. THE CURRENT CRISIS IN ARCHITECTURE

Architecture seems to have reached a crisis point regarding its place in contemporary Western society.

The architectural profession constitutes a sub-culture with its own

system of beliefs, values and norms which guide all architectural activity. However, the beliefs and values held by the profession are often at variance with those held by the public. The imagery of contemporary architecture has been developed within the profession and foisted on the public who find themselves living in an apparently hostile, inhuman and alienated man-made environment. The architect has become alienated from society; his decline in effectiveness has led to a general loss of confidence in the profession. Sir Hugh Casson (as quoted by MacEwan, 1974, p.11) describes in an article in The Times (27th February, 1973) the crisis of public confidence which expresses itself in widespread criticism of planners and architects :

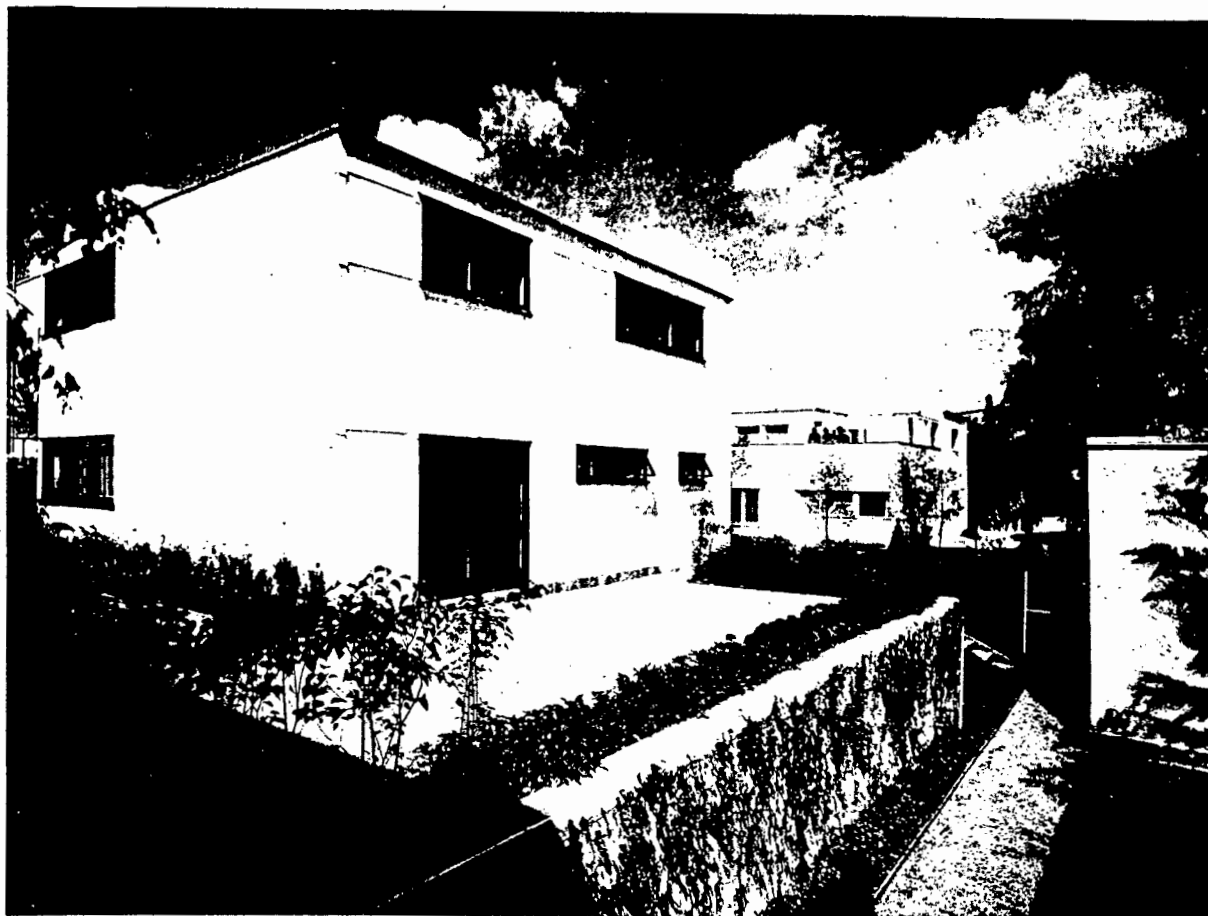
This disenchantment with architecture amounts today almost to a paranoia. Whatever the reasons, a situation has been created which is dispiriting and disturbing.

In order to understand the shortcomings of contemporary architecture the operant ideology of the architectural sub-culture needs to be examined and re-assessed. However, it must be noted that this ideology is not solely responsible for architectural theory and practice - the architectural profession operates within the context of the dominant ideology of the larger cultural group, and this ideology plays an important part in determining the nature and quality of the architectural product.

The Functionalist doctrine is still very much the current paradigm of architectural practice. Although it has recently been declared obsolete by numerous theorists (Jencks, 1978; Venturi et al, 1977; Brolin, 1976 and others) it is still adhered to by the majority of practicing architects and is particularly prevalent in South Africa today.

Functionalism is based on rationalist ideals; its basic premise is that the purpose or function of a building should define its form in the most direct manner and without any wasted effort. This doctrine, with its moral undertones, evolved from the puritanical spirit of pioneers such as Mies van der Rohe - "God is in the details" (Banham, 1962, p.154) - and Adolf Loos - "ornament is crime" (Banham, 1962, p.31) - to produce buildings which, supposedly stripped of artistic subjectivity, were obeying the demands of "truth". Reason and the machine aesthetic were, and still are, dominating principles : buildings are seen as the inevitable result of a logical process of design, and machines, venerated by the leaders of the Modern Movement for their rational functionalism, remain the model for the current aesthetic (excluding the small avant-garde e.g. Venturi, Graves, Charles Moore and others).

Brolin (1976), in appraising the failings of modern architecture, argues that it has been



Reason and the machine aesthetic
are dominating principles of the
Functionalist doctrine

- 4 (left) Lake Shore Apartments,
Chicago, 1957. (Mies van der Rohe)
- 5 (above) One-family house for Werkbund
Exhibition, Stuttgart, 1927.
Assembly from prefabricated parts.
(Walter Gropius)

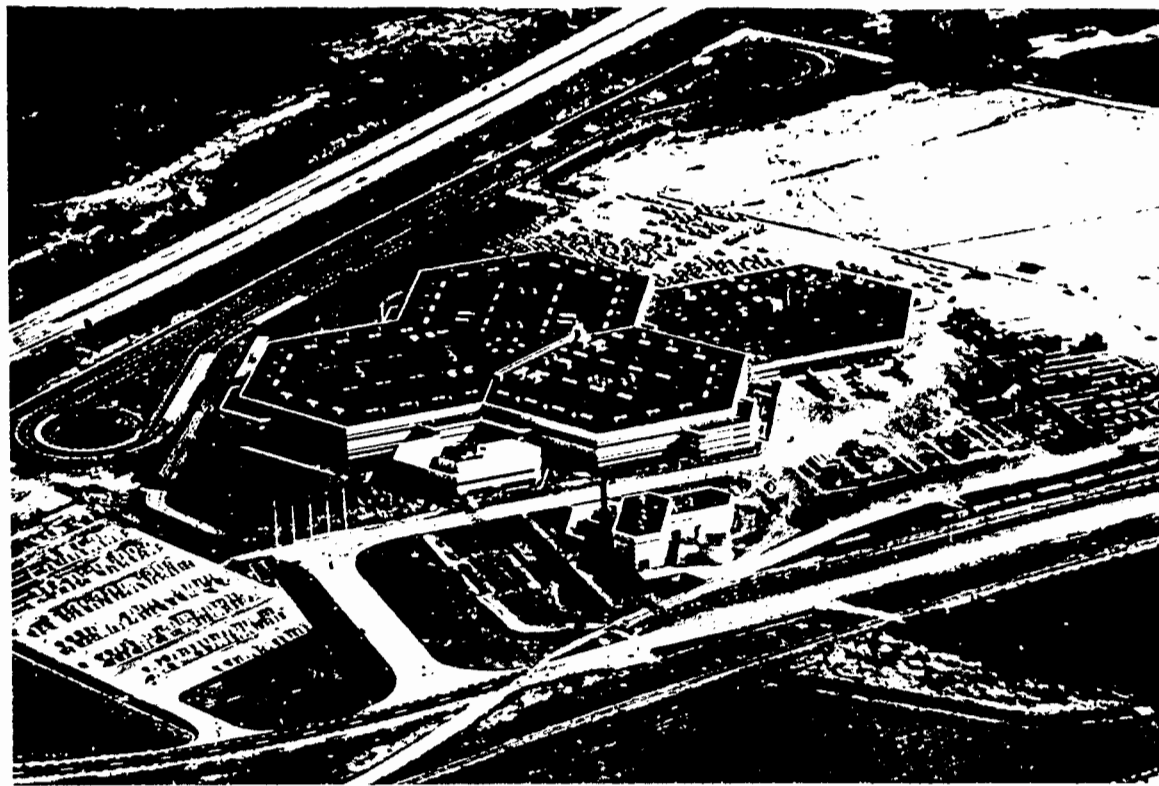


6 The "unfunctional" past.
Baroque church interior.

considered a movement of "truths" for so long that we are unable to think of it as a set of arbitrary, systematized aesthetic choices. By now, it has become an ideological prison that traps professional and non-professional alike as soon as they are initiated into its rules. (p.13)

Popular taste was rejected by the Modern Movement. The architect was, and still is to a large degree, seen as one who transcends the "fickleness" of popular taste; at the same time he was a potential leader and as spokesman for the "spirit of the times", would lead the masses, showing them the proper and "true" forms for modern times. The architect, in breaking away from the popular ideal, is out of touch with contemporary human aspirations and popular preferences.

Symbolic content was rejected in principle. (However, the protagonists of the Modern Movement failed to realise that by its very nature, functionalist architecture symbolizes a mechanistic image of man and society). An attempt was made to break architectural tradition and eradicate symbolic and historical association from architecture. This has been one of the most destructive ideological tenets of the Modern Movement; it has resulted in an alien architecture with very little human content and has frustrated man's innate desire for continuity with his past. Most



Alien architecture with very little human content.

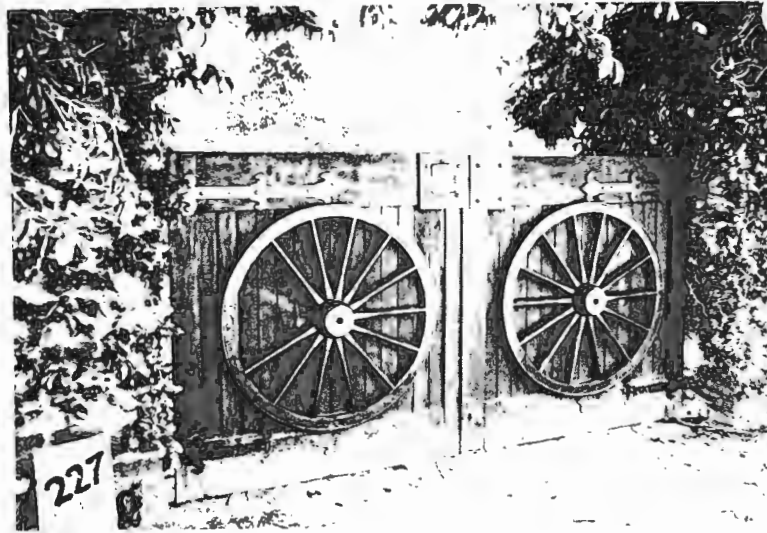
- 7 (left) High rise housing development, Boston
- 8 (above) Volvo factory at Kalmar, Sweden.

Modern architects have been obsessed with, to quote Aldo Van Eyck (referred to by Venturi, 1966, p.19), "what is different in our time to such an extent that they have lost touch with what is not different, with what is essentially the same".

This break with tradition has led to the disappearance of prototypes, and the syndrome of change for its own sake, which is characteristic of the Western civilized world. Christopher Alexander (1964) argues that it is this which has been largely responsible for the problem of "misfit" in contemporary architecture. The houses of simpler civilizations usually have better "fit" and clarity of organization. He gives the Mousgoum hut of northern Cameroun as an example. This, according to Alexander, is the result of an unselfconscious approach to the design process, which is to a large extent mimetic in that typical designs, based on traditional patterns, evolve by trial and error over an extended period of time. Myths and legends, social rituals and taboos connected with the dwelling resist change for its own sake. Today the designer attempts to solve problems from the beginning, working from scratch rather than building on to already established prototypical solutions. However, the intuitive resolution of contemporary design problems lies beyond the single individual's integrative grasp. Prinsloo (1978) refers to the problems inherent in the "disappearance of prototypes":

The architect has been launched into a position where he has to invent for each project. Not only this, but his ability to sustain a high level of inventions is given a high value in the profession and repetition is seen as some kind of failure. There is in this an important shift that has occurred, from the idea of the architect as the developer of prototypes and renewer of principles to that of "free-hand" inventor with reference to: what? Design and invention from scratch is too difficult and design with reference to programme only is inadequate. (p.39)

Where people have the choice and a greater role in determining their environment, as in the private housing sector, one finds the overwhelming majority chooses the single family house of suburbia. A brief survey of suburban houses, where the architect's impact has been moderated by the direct mediation of the home owner in the design process, reveals physical evidence of popular preferences and symbolic references to historical precedent and the idealized life : Cape Dutch style gables and shutters; Spanish style arches, rough plaster and timber beams; the traditional formal foot path leading to the front door (originating in European formal gardens); wagon wheel "vibracrete" walls and gas lantern-type outside light-fittings. These elements of suburbia, which at the same time serve as a means of self-expression, betray a conscious sense of the past and of romantic aspirations. The architect can no longer



9 Popular taste is reflected in suburbia. (Houses in the Western suburbs of Port Elizabeth).

afford to ignore or censure the fundamental human values expressed here. Robert Venturi has stressed this in his writings (1966, 1976, 1977) and embodies these concepts in his buildings. His essentially humanistic theory of architecture is espoused in his "Gentle Manifesto" (1966). Here he eschews the "puritanically moral language of orthodox Modern Architecture" (p.22) developing his polemic around the notions of popular taste and architectural history.

The Modern Movement arose in response to the limitations of academic architecture and in the context of the socio-political conditions in Europe after the First World War. It was linked to the movement at that time against Fascism, hunger and unemployment and was thus based at its inception, on humanistic concerns. In its attempts to transform the living conditions of the people (especially the poor) for the better, it called for the systematic examination of human needs and the use of technology to serve these needs. However, these optimistic and humanistic ideals have been debased and distorted over the years, largely due to economic and political forces of the Post World War II era; the Modern Movement has degenerated into a mere style, lacking the social content that formed the basis for its "raison d'etre". With the ideological basis drained away, Functionalism in architecture is still being

justified today in terms of its so-called economy, efficiency and rationality. It is not surprising that an architecture based on these "attributes", and on a mechanistic analogy of man and society fails to bring much joy and satisfaction to its users.

There is an urgent need to build a new theory of architecture, based on the salvaged humanistic and social concerns which formed the original impetus for the Modern Movement, but taking the whole of man into consideration i.e. not only his physical quantitative needs but also his consciousness and his experiential, qualitative needs. Human consciousness must be recognised and the modes of human experience investigated. The questions must be asked : "How do people experience their environment; how do they "see" their environment and what does it mean to them?" Pawley (1969) decries the functionalist doctrine with its neglect of concern for human consciousness :

The environment designer's recognition of function or role instead of consciousness [author's italics] as the basis for such "human engineering" as he attempts, is a contributory cause of the anxiety of meaninglessness which is a well documented neurosis of our time. (p.129)

MacEwan (1974) has argued that, to solve the current crisis in archi-

techure requires "not so much public relations to burnish the architect's image, as acceptance by architects of their social responsibilities" (p.7). Architecture must be consciously re-invested with a symbolic dimension, in an effort to respond to the many levels of human life, such as the personal, social, cultural and historical context. The emphasis on simplicity espoused by the Modern Movement belies the complex social reality of living. Norberg-Schulz (1969) emphasizes the need for a more "meaningful" architecture :

We are no longer satisfied with making our buildings functional, but we want them also to be "meaningful" ...
.... Architecture gives visual expression to ideas which mean [author's italics] something to man because they "order" reality. Only through such an order, only by recognizing their mutual dependence do things become meaningful. Such ideas may be social, ideological, scientific, philosophical or religious.
(p.223)

He stresses the importance of supplementing the physical milieu with a "symbol-milieu", that is, an environment of meaningful forms. Architecture, as a "synthetic activity" (p.226) unifies diverse factors in a single synthetic form. As such it must adapt itself to the form of life as a whole.

1.3. OBJECTIVES

1.3.1. Scope of this Enquiry

1.3.1.1. The long-range objective of this research document is to gain an insight into the nature of man-environment relations so that the knowledge thus acquired can inform the decision-making process of architects, as well as planners, policy makers and others involved in the making of physical environments for human habitation, and thus contribute towards the realization of an improved quality of built environment, and hence ultimately to the enhancement of human life.

1.3.1.2. The relationship between man and his environment can be examined from numerous perspectives, such as:

- . the study of overt behaviour in particular environmental settings, that is, patterns of use, etc.
- . the study of environmental manipulation, that is, how people adjust the physical environment to meet their requirements (this includes professional design).
- . the study of human adaptation to the built environment - stress, modification of life style, etc.

- . the study of environmental experience, that is, what the built environment means to people; what attitudes, values, beliefs and symbols influence this experience.

It is this latter perspective which will be used in this thesis. This area of concern recognises the complexity of the relations between man and the physical environment, a complexity which is becoming increasingly evident from ergonomic studies (such as Chapanis, 1959) and work on the effects on people of temperature, lighting, sound, etc. and other physical variables (Canter & Lee, 1974, p.10). These studies indicate that single variables or stimuli cannot simply be linked with specific subjective responses. The environment is not something "out there" acting on man; rather the environment and man form a complex interacting system involving man's experience and cognition of that environment.

1.3.1.3. This thesis aims to build a theoretical model, collating and organizing a vast body of research and theory from numerous academic disciplines, and at the same time expressing a particular point of view. It is intended that the theoretical framework espoused will provide a sound base for future empirical research.

1.3.1.4. According to a rudimentary survey (conducted by the author in 1979) of all human science departments, as well as all architecture and planning departments at every University in South Africa, very few formal research projects in the field of man-environment relations have been carried out at South African universities.

The University of Cape Town's Postgraduate Unit of the School of Architecture is however currently involved in studies which relate to this field: "Urban problems and urban structure" - Ivor Prinsloo, Jane Burnett-Prinsloo and Richard Hepner - is a study of community facilities and services, considered as instruments for social policy in developing areas, which provides the field of study from which broader goals relating to the occurrence of urban problems and their relationships with urban structure may be generated. A second project, "The urban public environment" - Ivor Prinsloo and others - is a study in the evaluation of the social and physical performance of existing urban areas with a view to the development of strategies for intervention which will lead to conditions of social and environmental health, with a special focus on design criteria supporting social learning and environment performance. Another study in the area of man-environment relations is that currently being under-

taken towards a doctoral thesis by Professor T. Lamont of the Sociology Department, UNISA. He is investigating the nature of existential residential space, tying together the theories of Talcott Parsons and Norberg-Schulz.

It is evident that South Africa is at an early stage in its exploration of man-environment relations. This thesis attempts to contribute to the development of the field of man-environment studies in South Africa.

1.3.1.5. It is intended that the proposed comprehensive nature of this thesis will bring together findings and theory from numerous diverse disciplines, thus drawing architecture closer to work done in these fields, an exercise from which it can only benefit.

1.3.2. Specific Objectives

1.3.2.1. This work aims to investigate how the individual conceives of, or "sees" the physical environment, how he gives meaning to it, what mental processes come into play in the structuring of the environment in the mind.

It sets out to examine the nature of the resulting cognitions; how

they arise and how they are influenced and modified by socio-cultural, personality and other variables.

This work attempts to understand how these subjective mental constructions influence human response with regard to the built environment, that is, behaviour, preferences, feelings and design.

These aims thus imply the application of a cognitive framework (rather than, say, a behaviorist model) to the exploration of man-environment relations. It is concerned with both the processes and products of cognition and considers the subjective beliefs, knowledge and impressions about the built environment which people carry "in their heads" in the course of their daily lives.

1.3.2.2. An important objective of this thesis is to define the nature of the built environment in terms of a theoretical framework. Alternate conceptions or definitions of the physical environment would result in different findings and conclusions with regard to man's relationship with the environment; thus a specific model of the environment will be proposed.

1.3.2.3. It aims to maintain a holistic perspective, employing a general systemic approach.

1.3.2.4. Work in environmental cognition has been carried out by numerous researchers in a wide range of disciplinary fields, including geography, psychology, sociology, town planning and architecture. (For a detailed account of environmental cognition studies, cf. Chapter 4). However, most of the research has been conducted on an urban scale, with very little reference to the architectural level of environment. This thesis will focus on the cognition of the physical environment at the scale of buildings.

It should be noted at the outset that this thesis does not attempt to provide an in-depth and detailed study of a particular, narrowly defined area of concern. Rather, it provides a broad general perspective, or overview, of environmental cognition.



11 People carry "a world inside their heads".

Methodological Approach

This chapter spells out the general methodological approach adopted in this enquiry. This approach embraces: a cognitive referential framework which gives structure to the question of man's relationship to the built environment; a holistic perspective, drawing on aspects of Talcott Parson's intersystems theory of human action; a multi-disciplinary orientation; and the use of the dialectical model to explain the relations between phenomena.

2.1. THE COGNITIVE FRAMEWORK

A theoretical frame of reference is postulated which links human experience and behaviour to the built environment. This framework is needed to synthesize and give structure to the numerous issues involved in the investigation of the man-environment interface and, to the diverse array of ideas and findings from many different disciplines.

A cognitive frame of reference is employed; this constitutes a viable and relevant framework for the examination of man's relationship to the built environment. It provides a reasonable parameter within which to explore the field. It is sufficiently defined, yet not too limited in its scope and potential for revealing the nature of the structures underlying man's environmental response.

A conceptual model is developed within this cognitive framework which presents the components and their interrelationships in such a way as to reveal certain aspects of the nature of man-environment relations.

2.2. A HOLISTIC APPROACH

Man's experience of the built environment will be examined using an intersystems perspective. This implies holistic thinking and the recognition of the total context within which environmental cognition occurs.

This systemic approach stresses the examination of the interrelations and mutual influence among interacting elements, as opposed to the more linear causal approach that strives towards the isolation and analysis of independent elements as they relate to a limited set of variables. The linear causal mode of thinking has led man to think of objects and phenomena (including ourselves) as independent, atomistic entities separate from one another and linked by simple causal connections. On the other hand, systems thinking, or holistic thinking, is based on the fundamental maxim that everything is interconnected with everything else in one ecological system, (for a concrete example of the difference between linear and systems thinking, cf. Leff, 1978, pp. 7-10).

The person-environment system is a complex and dynamically structured system of physical and non-physical variables which operate as subsystems. These interrelated and interdependent subsystems together form the total environment (Burnette-Prinsloo & Prinsloo, 1978, p.13). The physical environment includes both the natural world and man-made artefacts and structures; the non-physical environment incorporates the cultural, social (including political and economic) and psychological dimensions of our lives. The total environment is seen as a system of interrelationships such that any structure or subsystem within it derives its characteristics and function from, and in turn has consequences for, the nature and function of all other subsystems within the total system.

Man is an integral part of the complex web of interlinking processes in both the physical and non-physical environment and consequently of the total environment. Our experience, cognitive processes and overt behaviour arise from and can only be understood in relation to the total environmental context. In examining the interrelations of environment and experience, Leff (1978) notes that,

people come to think in given ways because of a huge number of interacting [author's italics] factors including the structure of their language; the beliefs

of their parents, teachers and peers; the things they are rewarded and punished for expressing; their intelligence and ability to imagine new things; feedback about the usefulness of a particular way of thinking; their willingness to tolerate uncertainty and to depart from the views of other people; the way they were brought up as children; the things they have read; and so on for an obviously long list. (p.9)

This study rejects the conception of simple cause-and-effect relationships. The scientific paradigm, which still dominates much research in the human science fields, of the causal analysis of behaviour in terms of single independent and dependent variables is abandoned here in favour of a more holistic perspective, embracing the total environment in all its complexity. This implies that the man-physical environment interface must be examined and described within the context of the broader sociocultural system which defines it. (Proshansky, 1976, p.303).

The idea that the total environment, including ourselves, is a unified system of interlinking processes has been recently referred to by numerous environmental psychologists, and others involved in environmental issues. Altman (1973) calls for a social-ecological approach which recognizes that "man is at one with his environment and that the

appropriate unit of study is a behaviour-environment or organism - environment unit" (p.108). Ittelson et al (1974) adopt a similar ecological approach: "the person has environmental properties as well as individual psychological ones. He is himself an environmental component, and how he interacts with his setting helps determine the nature of that setting and its effect on his actions" (p.12). Kenneth Craik (1976) also supports the application of a systemic approach to man-environment studies: "The conceptualizations of systems, system boundaries, and system relations offers a usefully broad perspective upon man-environment relations and upon the direction of research in this area" (p.73). Others who advocate a holistic approach and use it in their theoretical formulations include Leff (1978), Moos (1976) and Michelson (1970).

The holistic approach, which gives rise to the concept of man as an integral and interdependent component of the total environment and thus closely intertwined with the physical environment, has since ancient times been a fundamental element of Eastern philosophical and religious doctrines, as well as being basic to the religious rituals and world views of most primitive, or non-technological societies. It may be suggested that it is the Judeo-Christian doctrine with its emphasis on man as the centre of the universe

and standing apart from and distinct from, the rest of "The Creation" (i.e. a non-holistic view of man) which is responsible for the alienation of man from his environment. It is only in relatively very recent times that an intersystems approach has been consciously re-adopted and employed in academic pursuits by Western man.

For pragmatic purposes (because it would be impossible to study the total environment, giving equal emphasis to every component part) it is necessary to isolate and focus on particular subsystems and their interrelationships. Those variables specifically dealt with in this study are the social and cognitive systems, and the built environmental system.

2.3. TALCOTT PARSONS AND THE "HUMAN ACTION SYSTEM"

A theoretical scheme which offers a useful referential framework by which to study the man-environment interface holistically is provided in the work of the sociologist, Talcott Parsons. Parsons is a systems theorist who is concerned with the study of "societies as wholes" (1966, p.1); his recent works are generally cited as the best sociological example of general systems theory (Poloma, 1979, p.112). His theoretical scheme is interdisciplinary, requiring a knowledge of at

least biology, psychology, economics and political science for an understanding of how society as an "open system" (i.e. a system which is interdependent with its environment) operates (1970a). It is the interdisciplinary, systems approach of Parson's work which is of particular importance to this thesis.

Although it is clearly beyond the scope of this thesis to discuss in detail the strengths and weaknesses of Parson's "grand theory", it is important to see his work in a critical perspective. The work of Parson's has come under attack from numerous sources, including conflict theorists (C. Wright Mills and others) and social psychologists. The primary criticism is levied against the conservative bias inherent in structural functionalism (Structural functionalism, like all theory, rests on particular assumptions about the nature of society and the nature of human beings. However, these assumptions tend to be conservative, i.e. they focus on the existing social structure rather than on social change) and its inability to deal adequately with revolutionary or rapid social change. Although Parsons has attempted to move towards a revision of his functionalist model through general systems theory (his cybernetic model (1970b) represents an attempt to infuse the concept of change into his structural model), it appears that his revisions can still account for only slow changes within the

system, still failing to account adequately for violence and revolution (Poloma, 1979, p.121). Objections to his work have also focussed on the problem of empirically verifying his abstract theoretical formulations. (Raison, 1979)

Nevertheless, whilst recognizing the inherent problems in his macro theory, the attitude is taken here that Parsons has contributed substantially to the development of sociological thought and that although the possibilities of applying his theories in their total and pure forms are more limited than he himself has claimed, many of his conceptions do provide valuable perspectives and guidelines.

In the context of this thesis certain aspects of Parson's work are relevant and useful, specifically his "human action system". This provides a theoretical scheme of intersystem relationships, incorporating the physical and non-physical aspects of the total environment.

Parsons (1966) defines "human action" as consisting of

the structures and processes by which human beings form meaningful intentions and, more or less successfully, implement them in concrete situations. (p.5)

(He uses the word "meaningful" to imply the symbolic or cultural level of representation and reference; "intentions" and "implement" taken together imply a disposition of the action system to modify its relation to its situation or environment in an intended direction). He uses the term "action" rather than "behaviour", since he wishes to emphasize, not the physical events of behaviour for their own sake, but rather the patterning of events, their patterned meaningful products (ranging from implements to works of art), and the mechanisms and processes that control such patterning.

Parson's scheme emphasizes the situational factors contributing to human action and is based on the idea that the "human action system" comprises 5 primary, interacting subsystems, namely:

- 1) the cultural system
- 2) social system
- 3) personality system
- 4) behavioral organism
- 5) the physical-organic environment

Parsons treats each of these subsystems as fulfilling a functional imperative of the general action system. These subsystems, which in-

clude the political, economic and technological aspects of society, provide environments for each other. Each of the subsystems is subject to influence by, and capable of influencing each of the other subsystems. Parsons (1970a) emphasizes the interdependence of each of these subsystems when he observes:

Concretely, every empirical system is all of them at once; thus there is no concrete human individual who is not an organism, a personality, a member of a social system, and a participant in the cultural system. (p.44)

William Michelson (1970) a sociologist who has contributed a great deal to man-environment studies, has examined the interdependence of physical structure and social structure using a Parsonian framework. His "intersystem congruence" model is applied mainly to the study of how well different environments actually accommodate the characteristics and behavior of people who use them. This Michelson refers to as "experiential congruence". However, he also introduces the notion of "mental congruence" which deals more with the cognitive aspects of environmental experience: "Mental congruence exists if an individual thinks that particular spatial patterns will successfully accommodate his personal characteristics, values, and style of life" (p.30), regardless of whether they can be empirically

substantiated or not. He cites the example of the large number of people who believe that the suburbs are a good place to raise families. This state of mental congruence between "familism" and "suburbanism" can exist even though a state of experiential congruence between the two may not. Thus, although Michelson does not develop this theme, he does recognize that people's perceptions and conceptions of their environment are often more important than the realities of the environment itself.

Parson's "human action system" serves as a general frame of reference within which the theoretical formulations of this thesis are developed.

2.4. A MULTIDISCIPLINARY ORIENTATION

The holistic intersystems perspective proposed in the previous section requires that the traditional boundaries between the academic disciplines be transgressed. The rigid adherence to these artificial demarcation lines, tends to limit the advancement of knowledge and understanding.

Similarly, Bruhn (1974) suggests that there is no single best approach to the study of human ecological problems and that single disciplinary studies of man-environment interrelationships, and processes that affect these relationships can provide only a small glimpse of the total eco-

logical complex (pp. 105-125).

An important objective of this thesis is to draw on theories and research findings from numerous disciplines and thus to bridge many arbitrarily defined boundaries separating fields, which at least potentially, can contribute to a greater understanding of the way people experience their physical environments.

2.5. THE DIALECTICAL MODEL

The dialectic is a conceptual model of universal relations and their transformation through time. All phenomena are seen as being in motion, in a process of perpetual change. Transformations in the total environment develop by a process of: thesis → antithesis → synthesis → Each event or phenomenon (thesis) contains within it internal contradictions (the "seeds of change") which then generate the development of the antithesis which is synthesized to form a new thesis. This thesis again contains within it internal contradictions, and so the process repeats itself, not in a linear nor a cyclical pattern, but rather in a forward-moving spiral-like pattern.

The idea of dialectic originates in the work of Hegel. However, its impact in the intellectual forum was significantly heightened when

Marx and Engels, having liberated it from Hegelian idealism, applied it to an interpretation of man in society. The dialectical model forms a fundamental framework for Marxist theory and it is in this context that it is most widely known. However, the dialectical model, as a doctrine of the universal laws governing the development of nature, human society and thought, is in no way bound specifically to Marxism; it has a more general application.

The dialectical model is a useful construct by which to explain the nature of relationships between certain phenomena. It is used in this thesis to explain and describe the underlying structure of the relations between human experience and the built environment. It emphasizes the mutual influence between these phenomena and the dynamic nature of their relations over time. Man is viewed as being in a dialectical relationship with the built environment; he is not a passive product of his environment but rather, he interacts with the environment, shaping it and in turn being shaped by it in a spiralling creative process.

The adoption of the dialectical model to explain the relations between human experience and the built environment represents a departure from Parson's cybernetic model of intersystem relations

which stresses a cyclical and hierarchical structure (1970b and Parsons et al, 1961). Whilst his general categorization of systems and their interdependent nature are accepted here, the specific pattern of relationships which Parsons proposes and the cultural deterministic position which he adopts is rejected in favour of the dialectical model of relations between these variables.

Underlying Premises

Very little attention has been given in the literature on man-environment studies to the implicit "models of man", definitions of "environment", epistemological bases, etc. on which specific ideas and investigations are based. However, whether or not acknowledged and made explicit, assumptions on these issues are implied in all research on the relationship between the built environment and the human condition.

This section examines some of the basic premises underlying the theoretical position outlined in this study. Certain important assumptions which guide the work are made explicit. This exercise follows Popper's belief (according to Bryan Magee, 1973) that

we, all of us, take a great number of things for granted, and many of these assumptions are of a philosophical character; we act on them in private life, in politics, in our work, and in every other sphere of our lives - but while some of these assumptions are no doubt true, it is likely that more are false and some are harmful. So the critical examination of our presuppositions - which is a philosophical activity - is morally as well as intellectually important. (p.15)

Presuppositions are discussed regarding 1) the role of theory, 2) the nature of man, 3) the extent of environmental influence on human behavior and experience, and 4) a definition of reality.

3.1. THE ROLE OF THEORY

It is important to put the entire body of theoretical work presented in this thesis into perspective. This section explicates some ideas about the notion of theory which underly this thesis; ideas about the function of theory, the limitations of theory and what can be reasonably expected from a theory.

The primary objective of theory building is to organize apparently unconnected ideas and knowledge into a coherent framework capable of 1) explaining phenomena, 2) predicting probable patterns of phenomena and 3) forming the foundation of new research. Moore and Gollidge (1976) define the role of theory:

Theories organize and systematize bodies of knowledge by carefully itemizing the relationships between bits of knowledge ... Once the basic theorized relationships are made clear, further knowledge accumulates by unpacking sets of interrelationships [authors italics] among the bits of knowledge and examining their meaning and use. (p.28)

They also point out that problems peculiar to researchers attempting to construct theories related to environmental cognition arise from the fact that they must be concerned not only in the external socio-physical environment and the internalizing of human actions, but also with the interface between the two (p.28).

However, to explain the phenomena in question is not merely to show that they are instances of well-established regularities; theories need to explain those regularities. The necessary connections between phenomena must be sought by acquiring knowledge of the underlying structures and mechanisms at work. Thus, in this sense, a theory can be defined as a description of the structures and mechanisms which contribute towards the existence of a particular phenomenon.

The well-known conclusion of the French physicist and historian of science, Pierre Duhem (1954, Part 2, Chapter 6) that there can be no crucial test to prove or refute a hypothesis or theory has had far reaching implications and is widely accepted in the academic fraternity:

no matter how many tests are carried out, the law cannot be said to be certainly verified since there always re-

mains the possibility that the $n + 1$ th observation, following a finite series, will be inconsistent with it. (Giddens, 1976, p.140)

Since no theory can be subjected to all possible tests to prove its truth, Kuhn (1970) notes that "few philosophies of science still seek absolute criteria for the verification of scientific theories they ask not whether a theory has been verified but rather about its probability in the light of the evidence that actually exists" (p.145). Theories are not true or false - they are only more or less useful in their explanatory potential. Theories can be compared according to their ability to explain the evidence at hand. When one theory is no longer as convincing as another, it is replaced by a theory with more explanatory probability.

Feyerabend (1978) takes the point further. As a self-proclaimed "scientific anarchist", his guiding principle is "anything goes" (p.28) which indicates his general attitude towards theories. "We can only speak of what does, or does not, seem appropriate when viewed from a particular and restricted point of view" (p.21).

Kuhn (1970) notes that it has been repeatedly demonstrated "that more

than one theoretical construction can always be placed on a given collection of data" (p.76). Since there can be no "absolute" theory which represents the "truth" as such, the theories subscribed to at any given time must be held tentatively, with the awareness that they are valid only insofar as they are useful, that is, as long as they continue to offer the most convincing explanation of the particular phenomenon being examined.

The related notions of theory and practice have co-existed over the centuries in all disciplines, fluctuating in importance and emphasis. Architecture, as both art and science, has traditionally placed its emphasis on practice and shown relatively little concern with academic theory building. Very few fully fledged and developed theories of architecture are to be found in the literature. Theory is, however, essential to direct the practical activity of architectural design and planning. At the same time it is not enough to remain at this abstract level; abstract concepts must be imbued with life. Theory not confirmed in praxis - that is, action based on critical theory with the intention of transforming reality - is relatively impotent.

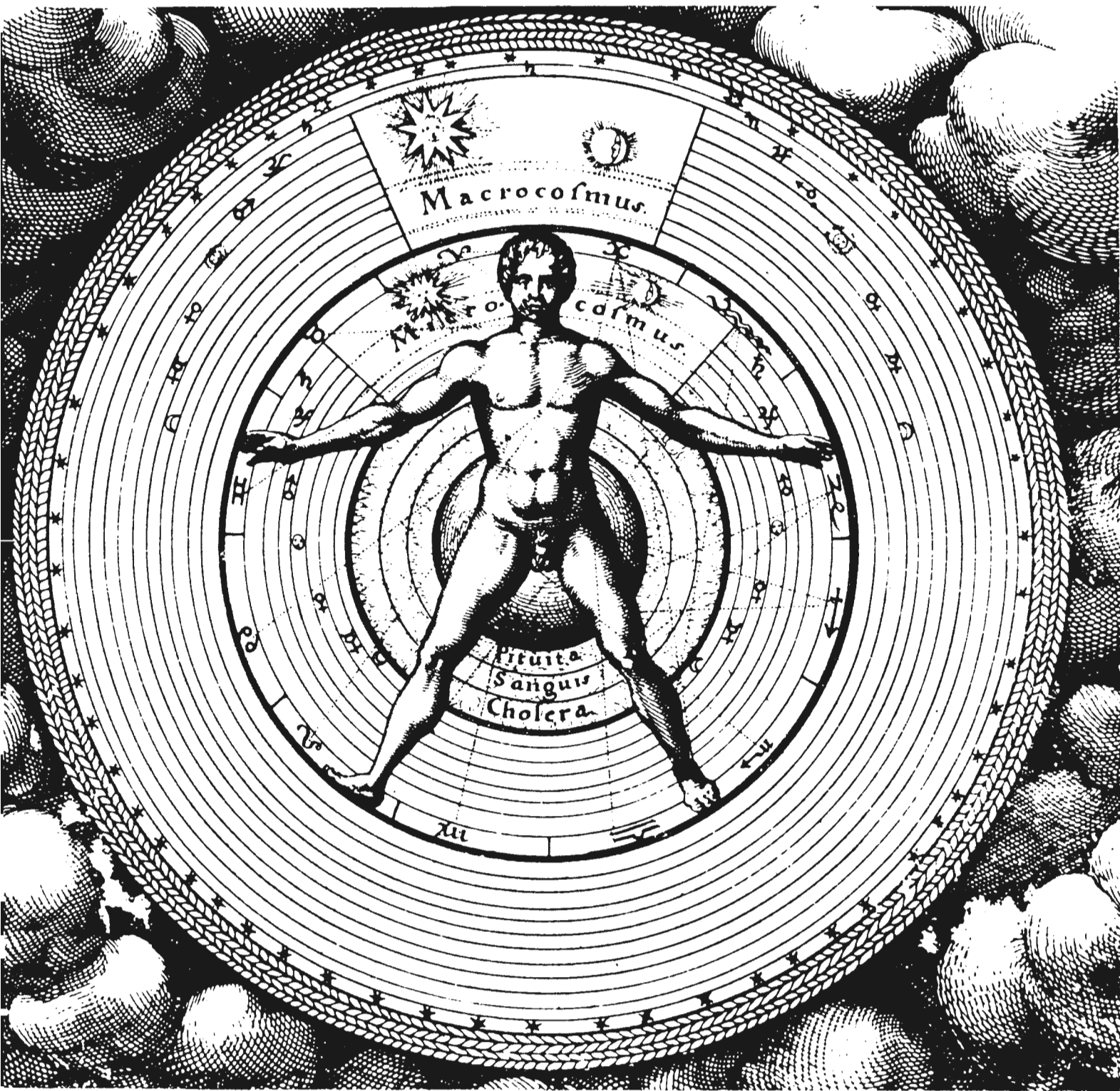
Theory plays a necessary role in bridging the gap between human science

research and environmental design. A theoretical framework is needed to link human experience and behavior to its environmental context. Theory, however, plays a different role within the human sciences from that within the design professions. For the behavioral scientist, theory integrates diverse experimental findings and indicates which variables should be explored in further experiments, which variables must be controlled in these experiments and which ones can be safely ignored. For the designer, a theory provides the grounds for making predictions about design solutions that have not been the object of specific research. It is through theory, as well as intuition, that the designer can anticipate the impact of a proposed design project before it is actually implemented.

The theoretical model and concepts outlined in this work do not represent a complete and fully resolved theory but rather can be seen as moving toward such a theory, that is, certain theoretical notions are discussed which might lead to the advancement of our understanding of man's relationship to the built environment.

3.2. ASSUMPTIONS ABOUT MAN

Any theory of man-environment relations must be based, at least implicitly, on certain assumptions about both the nature of man and the



12 Any theory of man-environment must be based on a particular model of man.

nature of the environment. Different views about human nature (and about the environment) lead naturally to different conclusions about the role and significance of the environment in human life processes, and subsequently to different decisions in planning policy and the design of man-made environments.

Since these assumptions are integral to the formulation of a theoretical model of man's relationship with his environment (including his experience of that environment), and act as a point of departure in the processes of environmental planning and design, it is important that the particular view of man underlying the theoretical postulations of this thesis should be defined and made explicit.

There is much controversy regarding the appropriate model of man upon which to base theoretical and practical procedures. It has also been argued, especially by Sartre, (1948, p.28) that "there is no human nature" about which there may be true or false theories. This is a typically existentialist rejection of general statements about man. Man simply finds himself existing and then has to decide what to make of himself; he has not been created for any purpose, neither by God, nor evolution nor anything else. He has the freedom to decide what to make of himself - "Man is nothing else but that which he makes of

himself" (p.28). However one could argue that Sartre does not mean to deny that there may be certain properties which are universal to human beings, e.g. the need to eat in order to survive. His central assertion that "man is condemned to be free" is itself a general statement about the human condition. Presumably what Sartre means is that there are no "true" general statements about what all men ought to be (which is in keeping with his rejection of any notion of objective values (1957, p.38).

Different models of man have been held during the course of man's history; not only are these different views of man time-related, but they are also culture-bound, e.g. the traditional Western view of man, is rooted in the Greek philosopher, Protagoras' dictum, that "man is the measure of all things", as opposed to the oriental view of man as being an integral part of nature, rather than the centre of the universe. These differing conceptual attitudes about man have had a definite impact on thinking, as can be seen in the history of science, religion and the arts.

Different conceptions of man are prevalent within the human science disciplines. Altman (1975, p.201) has isolated four different models of man that have an important influence on current research and prac-

tice in the man-environment field of study:

- 1) The "mechanistic model" - which views man primarily as a task-orientated, performing organism - it places emphasis on performance-related behaviours. This model was popular in the 1950's and early 1960's but is no longer widely recognized today.
- 2) The "perceptual-cognitive-motivational model of man" is prevalent and dominates much thinking in man-environment studies at the present time. This approach conceives of man as an organism with several internal processes (perceptual and cognitive responses, motivational and emotional states, etc.); it is more concerned with subjective psychological processes than with overt behavioral responses.

Various techniques are available for the measurement of how man "sees", feels and evaluates the environment, e.g. Osgood's Semantic - Differential method (Osgood et al, 1957), Kelly's Repertory Grid Technique (Kelly, 1955) and the use of "cognitive maps" as described by Downs and Stea (1977).

- 3) The "behavioral model of man" defines man as an essentially

behaviorally functioning organism. This approach to man emphasizes the study of overt behavior rather than internal psychological processes, that is, the unobservable feelings, thoughts, images, etc, which people have.

- 4) The "social" - systems, ecological model of man" is a relatively unexplored approach in man-environment studies. A central theme underlying this model is that people-environment relations are part of a complex ecosystem. There is a reciprocal relationship between man and his environment; each influences and shapes the other in a dynamic time-linked sense. Man is thus seen as an environmental change agent, not merely a recipient of environmental influences. Altman (1975) has adopted this model in his analysis of the relationship between the built environment and social interaction.

It should be noted that the "model of man" presented in this thesis is not a formal theoretical structure with a fully developed, integrated and articulated network of principles and concepts, but rather a set of general assumptions about man as he relates to the physical environment. The assumptions proposed serve merely as a broad general approach, a working strategy, for

the study of man's experience of the built environment, and as such, has distinct implications for how the environment should be conceptualized.

These assumptions represent a synthesis of ideas from both the cognitive-motivational and the ecological models of man discussed above.

3.2.1. The complexity of man

Shakespeare's famous lines from Hamlet express a sense of awe at the complexity and greatness of man:

What a piece of work is man! how noble in reason!
infinite in faculty! in form and moving how express
and admirable! in action how like an angel! in
apprehension how like a god! the beauty of the world!
the paragon of animals! (Act 2, Scene 2).

However, the complexity and uniqueness of man is vested, not only in his diverse capacities to think, to experience, to act, and so on, but in the "interrelated" [author's italics] nature of all these functions and processes" (Ittelson et al, 1974, p.83). Experience, for example, arises and operates within an enormously complex system

of action, perception, thought, emotion, interpretation, etc. which is functionally related to physiological, social, cultural and physical environmental circumstances.

Thus the first assumption about man is constituted in the conception of man as a complex and dynamically organized system whose behavior and experience express the intricate interrelations among his interacting functions and processes. (Ittelson et al, 1974, p.83).

Man's relationship to the built environment cannot be studied by analyzing specific experiences or behaviors in isolation. Reductionistic-analysis, which seeks to understand complex human processes by establishing their basic irreducible elements, e.g. the S - R unit of behaviorism, is limited in that man is more than a sum of his parts and should be viewed in a more holistic sense. The Gestalt dictum that "the whole is more than the sum of its parts" expresses the idea that it is not merely the sum of a person's mental and physical characteristics, but the pattern of interrelationships which occur when these characteristics are grouped together that gives the total configuration its own uniqueness.

3.2.2. Man is an integral part of the total environment

Since both man and the built environment form an integral part of the total environment, that is the physical and non-physical environments (cf. Chapter 2.2. - The Holistic Approach), the relationship between man and the built environment is further complicated by these contextual implications.

Behavior and experience with relation to the physical environment is not simply a function of inner-organismic factors, such as physiological, psychological, socio-cultural forces (that is, needs, values, aspirations, belief systems, etc.); neither is it simply a function of external socio-physical situational demands; it is also not a function of the summation of both internal and external factors. Behavior and experience is determined by the interaction of all these factors, each in the context of the others and in the context of their mutual interactions. This reasoning, that it is the pattern of relationships between intra- and extra-organismic factors in the total environmental context, that determines the individual's experience of a particular environment and his behavior in that environment, is integral to the proposed model of environmental cognition which is introduced in Chapter 7 - the Concept of Environmental Cognition.

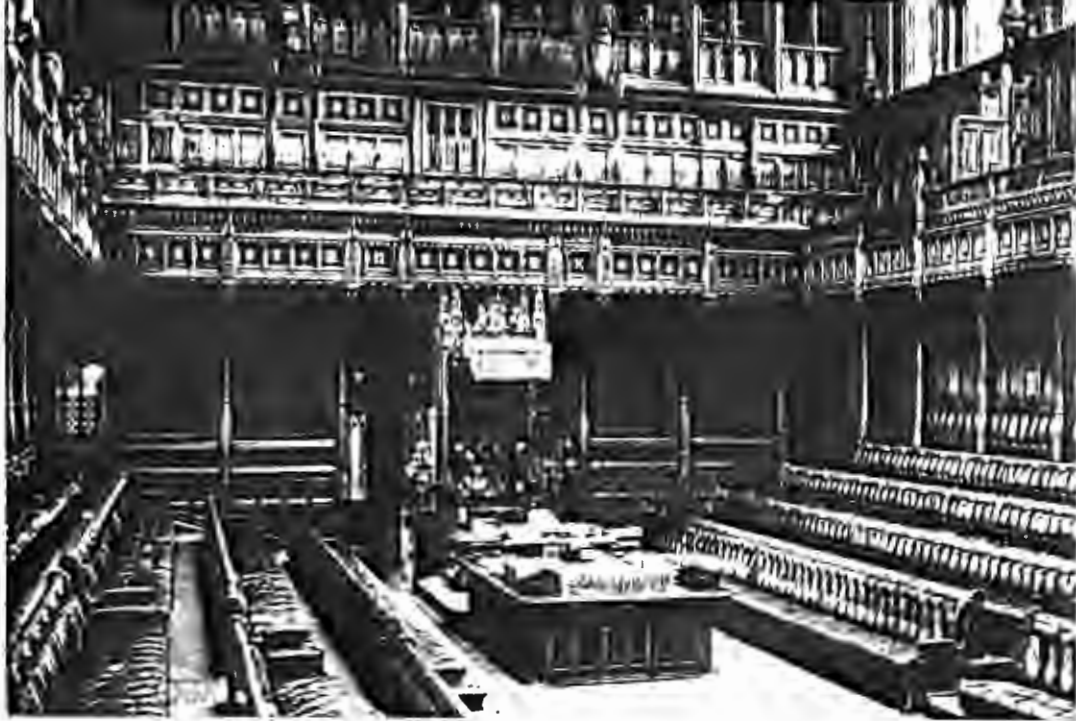
3.2.3. Man lives in a dialectical relationship with the built environment

Traditionally, the social and behavioral sciences have studied man as if he was separate from the physical environment. Barker (1968), Altman (1975) and others, have recognized that behavior must be studied within an environmental context; it is impossible to separate behavior from its socio-physical context, since behavior and milieu are dynamically and intimately connected. Barker proposes a people-environment unit, the "behavior-setting" as the appropriate unit of study.

This brings us to the third assumption about man, that is, that he exists in a dialectical relationship with the built environment. There is mutual impact between man and his environment, resulting in the modification and ultimate transformation of both phenomena in an ongoing spiral-like process (cf. Chapter 2.5 - The Dialectical Model). Thus, while the built environment is a material product of man's interaction with the total environment and reflects characteristics of that environment, the built environment is in turn an active influence on man's experience and behavior. In other words, man's behavior and experience can only be fully understood in the context of the total organism-in-environment situation and as a function of

the particular ongoing transaction between the two. (This follows the transactional position discussed in Chapter 3.4.)

The influence of the built environment is not one of simple causality where a particular environmental configuration necessarily determines a particular behavioral or experiential response. Whilst the arrangement of furniture and objects in a room, the layout of rooms within a building or buildings within a neighbourhood, as well as more qualitative aspects of ambience, distinctiveness, etc. clearly do influence man's response, this influence is of a reciprocal rather than simple causal nature. This reciprocal process is succinctly described by Sir Winston Churchill's well-known observation that "we shape our buildings, and afterwards our buildings shape us" (quoted by Deasy, 1974, p.5). Speaking in 1943 after German bombers had destroyed the House of Commons, Churchill was urging its immediate reconstruction despite the acknowledged inadequacy of the size of the Chambers. His argument was based on an astute understanding of how the shape of a meeting chamber influenced party discipline. Parliamentary debates had been conditioned by the physical character of the oblong form of chamber in which the face-to-face arrangement offered a pattern of confrontation rather than co-operation, and also imposed a restraint on impulsive "crossing the floor" and switching parties. To change this



13 The Chamber of the British House of Commons, 1935.



14 The rebuilt Chamber as it stands today.

physical form would affect the manner of debate and possibly undermine the very structure of British democracy.

3.2.4. Man is a goal-orientated organism

Another presupposition regarding the nature of man is the conception that man is a goal-directed organism. This is an important assumption, since it draws attention to the intentionality of man and denies that his behavior and experience is simply a mechanistic response to particular stimuli. The purposiveness of man is a major determinant of environmental cognition, experience and behavior.

What are the fundamental human motives that initiate and direct behavior in ways and towards ends that will satisfy the individual? This question has been asked for centuries by politicians, theologians, philosophers; and in recent times sociologists, psychologists and others have attempted to uncover and define man's basic needs and wants. Needs are rooted in the physiological, psychological and social systems of man. Hunger, thirst and respiration for example are physiologically based and necessary for the existence of the individual; sex and maternal behavior are physiologically based, but psychologically and socially influenced. The frustration of the sex drive or maternal

"instinct" in no sense threatens the existence of the individual. Research in sensory deprivation (e.g. Zubek, 1969) has shown that the satisfaction of merely physiological survival needs, such as food, water, warmth, etc., does not lead to a satisfying existence.

Piaget's concept of "equilibration" provides an insight into the psychological processes whereby man strives to resolve tensions that arise in the course of his cognitive development. Briefly, "equilibration" involves a dialectical process whereby mental structures are modified over a period of time to achieve a relatively stable (but inherently dynamic) functional cognitive structure. Piaget contends that the need for balance provides an intrinsic motivating force underlying the individual's interaction with the environment. Equilibrium is attained as a result of interaction between the individual and the environment. (Phillips, 1969, p.13)

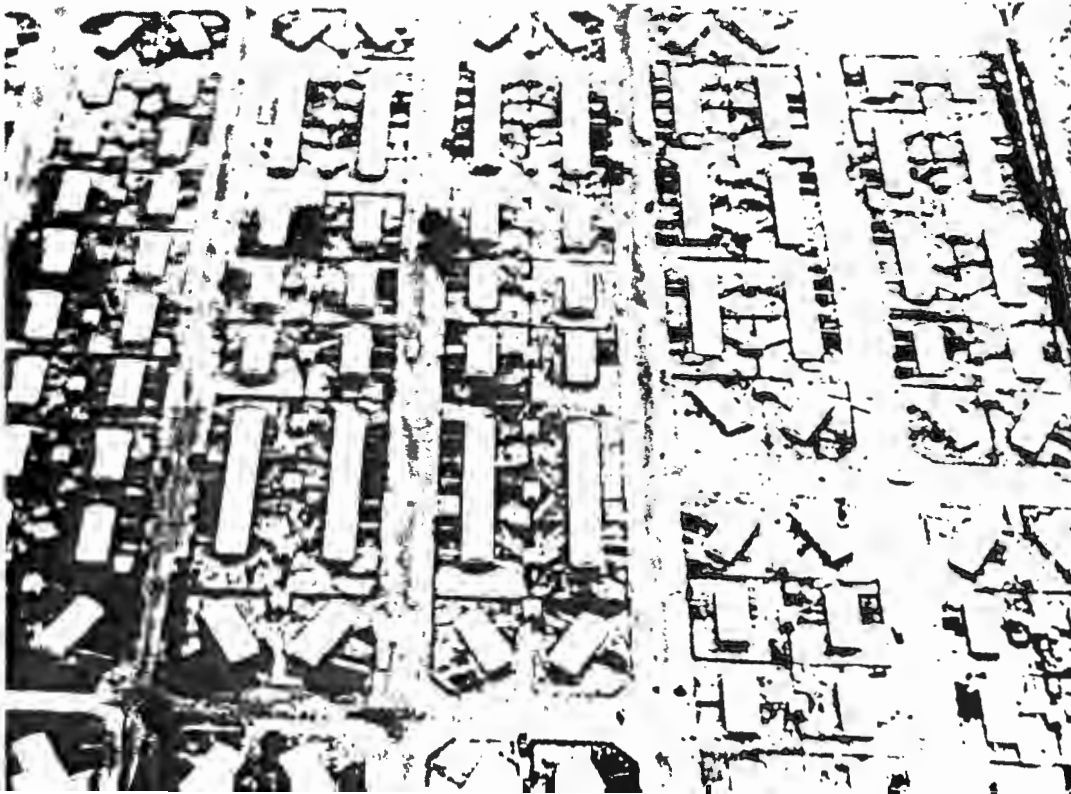
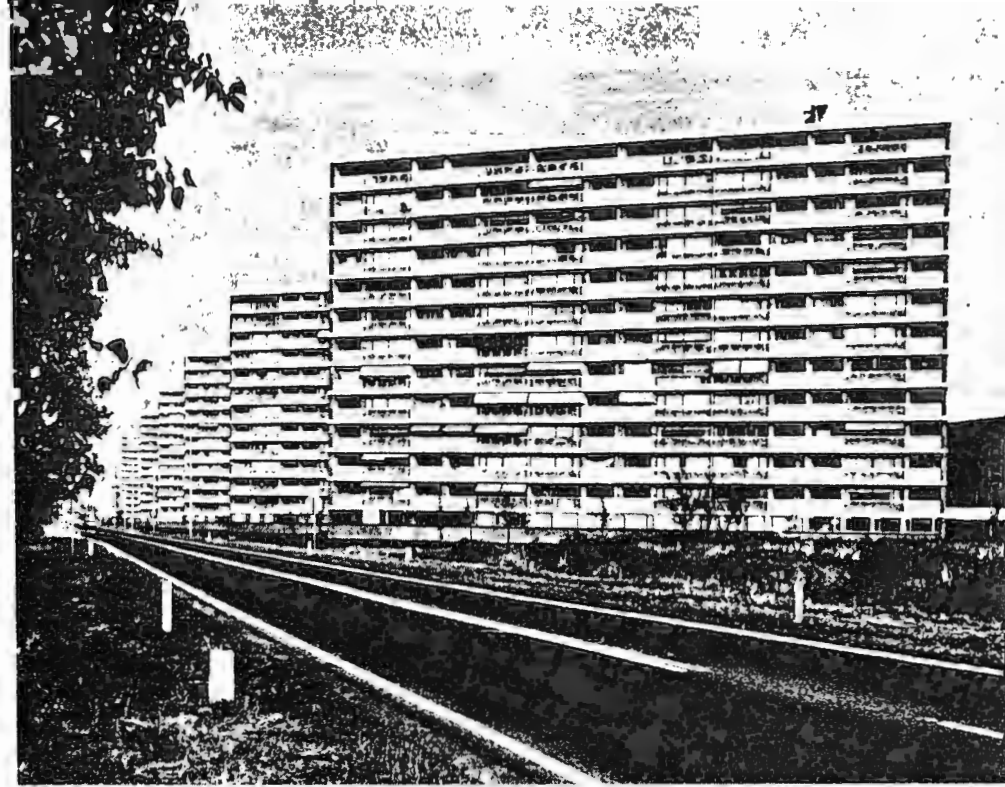
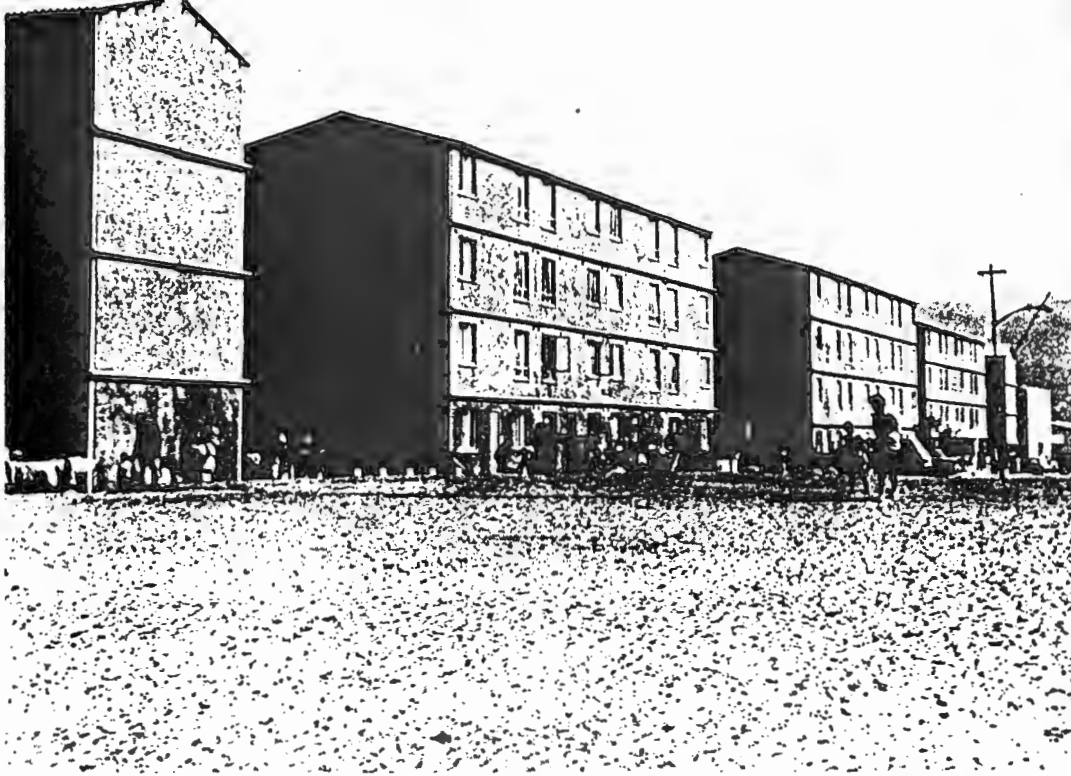
The more complex motives of the individual - his need for self-esteem, affiliation, recognition, security, privacy, etc., so that he may fulfill himself as a creative, productive and autonomous human being - are rooted in the values of his socio-cultural system. It is these needs, the fulfilment of which is essential

for the attainment of a satisfactory quality of life, that are so frequently ignored by policy makers, planners and designers.

According to Proshansky et al. (1970, p.170), what has emerged in recent years from extensive work in the field of human needs and motivations seems to be a general consensus among human scientists that man's needs and wants are many and diverse and that their sum and substance are ultimately a product of socialization. He suggests that the distinction between primary drives (e.g. hunger and thirst) and the more complex secondary, or learned social motives (e.g. the need for status, affiliation, recognition) is in fact fallacious:

All human drives, both primary and secondary, are in the last analysis the product of the individual's experiences in a series of socio-cultural systems - the family, neighbourhood, geographical region, and so on. The intensity of the person's hunger or sex drive, the objects that satisfy it, the means of achieving these objects, and even his responses to frustrations of these drives are as much a function of human socialization as are the secondary or more complex social motives. (p.170)

The physical environment plays an important role in the satisfaction



Psychological and social needs
have been ignored by policy
makers and designers.

- 15 (left) Coloured housing on the
Cape Flats
- 16 (above) High-rise housing in the
Netherlands.

of man's needs and the achievement of his goals. In terms of basic survival, man always stands in a relation of need to the physical environment - air, food, water, shelter are essential requirements which are provided by the environment. In terms of social and psychological goals, the physical environment is relevant to the extent that it facilitates or hinders the accomplishment of those goals which an individual sets out to achieve, and by which he defines himself. If a particular physical environment does not offer the potential for achieving these goals, a number of alternatives are open: he can (a) move to another environment (if it is possible), (b) re-organize it, (c) adapt to it by adjusting his goals and learning new behavioral responses, or (d) he can remain in the particular environment and suffer stress due to the frustration of his needs.

3.2.5. Man is a cognitive animal

Man has been defined as a goal-directed, mobile organism capable of manipulating his environment or changing his position in the environment. In this respect he is not different to certain animals: birds, for example, build nests to protect their young and migrate to more hospitable environs in the cold months. However,

what makes man distinctive are his cognitive capacities.

The concept of cognition is discussed in more detail in Chapter 7 in the specific context of "environmental cognition". What follows here is a brief discussion of the general nature of cognition and its role in human life processes.

Cognition refers to the psychological processes by which the individual gives meaning to and attains knowledge of the world around him. Pikunas (1976) defines cognition:

Perceptual grouping and modelling, encoding and decoding, underlie the process of cognition. Broad in its function, cognition [author's italics] refers primarily to conceiving and dealing with concepts, analyzing and synthesizing, deciding and theorizing. As a generic term it encompasses all processes by which knowledge of an object or relationship is attained, including sensory data and perception, memory and imagination, hypothesizing, and other logical operations. (p.90)

Psychologists have shown that cognition is a complex process involving many variables. The naive realist view that we simply perceive a world which is common to us all has been shaken by the

relativist views of contemporary theorists. The processes and resulting products of cognition are influenced by a complex network of interrelated factors operating within the total "human action system" (cf. Chapter 2.3 - Talcott Parsons). Norberg-Schulz (1971, p.10) confirms this with his contention that we see:

different worlds which are a product of our motivations and past experiences. In general, perception [cognition] aims at valid assumptions about the nature of the environment, and these assumptions vary according to the situations in which we are taking part.

For example, a bus driver bases his actions on different assumptions from those of a pedestrian in the same street.

The alternative to this view of man, as actively selecting and processing environmental stimuli, is what Popper refers to as the "bucket theory", where the mind is an empty receptacle to all environmental inputs (Popper, 1972).

Piaget uses the concept of "schemata" to explain how the developing individual orders his world and gives meaning to it in the process of gaining increasingly more complex functional knowledge of his world.

"Schemata [author's italics] are the cognitive structures by which individuals intellectually adapt to and organize their environment" (Pikunas, 1976, p.18). Piaget's theory demonstrates that any stimulus from the external world is filtered through a mental structure of schemata which thus influences the resulting conception.

Cognition, or the ways in which the individual processes information, is intimately related to the content and quality of his experience and to the manner and effectiveness of his behavior. It is thus the single psychological process most critical for man-environment interaction and forms the focus of this thesis.

3.2.6. Man has a non-rational dimension

It is important to recognize the non-rational aspects of man's nature, that is, the part played by affect and emotion, since these exert an influence upon both behavior and experience.

Leff (1978, p.83) draws a distinction between "affect" and "emotion":

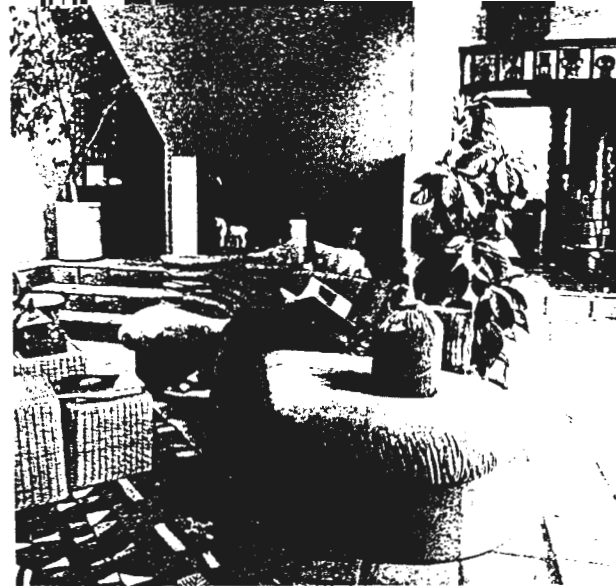
Affect [author's italics] is a psychological term for the inner experience of an emotion or feeling. The term emotion, [author's italics] by contrast, is used

to refer to the combination [author's italics] of experiential, behavioral, and physiological processes involved in states such as anger, fear, and joy.

Feelings such as aesthetic pleasure and displeasure can thus be seen as affects.

For Piaget, schemata include affective states, since emotions cannot be separated from cognitive processes. There is a fusion, with a predominance of either cognition or emotion.

Not only do people evoke affective and emotional responses; cities, neighbourhoods and rooms can be "friendly", "frightening", "hospitable", etc. and evoke affective states such as fear, joy and pleasure. Besides the experiential aspect of these emotions in themselves, they also provoke and direct particular behavioral responses, e.g. a person might avoid or move rapidly through an unpleasant or frightening place, or he might try to modify and improve that place. Ittelson et al (1974) draw attention to the reciprocal relationship between places and emotions: "Places may evoke particular feelings, and already existing feelings may colour the individual's perception of places" (p.88).



Places evoke different
emotional responses.

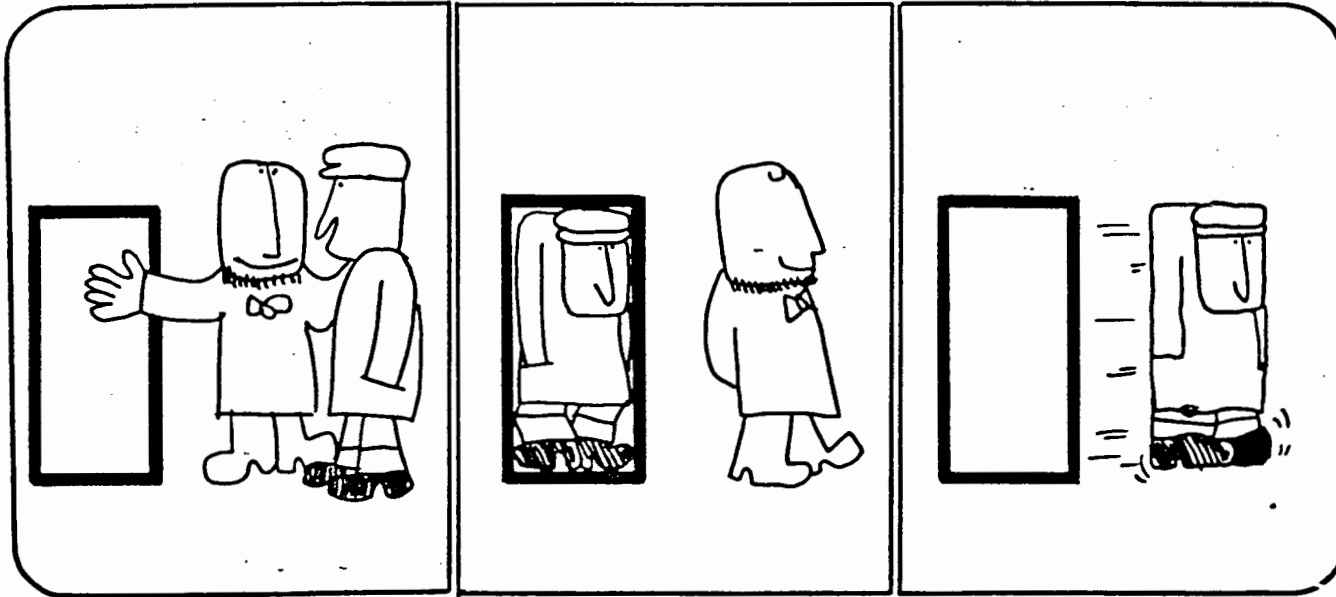
- (Clockwise, from above left):
- 17 The great foyer space of the Hyatt Regency Hotel, Atlanta (John Portman);
 - 18 Living space in the Burns House, Santa Monica, California (Charles Moore);
 - 19 interior of Amiens Cathedral;
 - 20 Decumanus at Gerasa.

The way a person experiences a particular environment is influenced by the affective state he brings to the situation, e.g. a man who has just had an argument with his wife and is feeling irritable and angry may experience a particular room as "restrictive" or "loathsome", whereas a man who has just won the jackpot and is feeling "on top of the world" might experience that same room as "cosy" and "pleasant".

3.3. ARCHITECTURAL DETERMINISM

For decades, geographers, planners and architects, psychologists, sociologists and anthropologists have debated the question of whether the physical environment has significant behavioral and attitudinal effects on people, or not.

The deterministic model holds that the physical environment determines human behavior and social patterns. Richard Neutra's now infamous statement: "Let me design a house for a happily married couple, and I can have them divorced within six months" (quoted by Alexander, 1969, p.183) embodies the view of architectural determinism. According to this view, with its behaviorist underpinnings, the architect holds a very powerful position by which he can manipulate the physical environment to produce specified behaviours. This notion of environmental, or in this particular case, architectural



21 "We shape our buildings and our buildings shape us."

determinism, implies not only the negation of free will and a passive one-way moulding of man by the environment, but also that the physical environment is the exclusive determinant that totally shapes behavior. This however, is no longer widely recognized as a valid approach.

At the opposite extreme of this model is the view that the physical environment plays no role in influencing human behavior. However, between these two polar extremes there are more moderate views where some degree of influence is recognized. Conclusions drawn from numerous findings (for example, Cooper, 1975; Michelson, 1970) indicate that design has some social and behavioral implications, but not as many as some designers wish to believe; that negative implications outweigh positive ones and that bad design can hurt more than good design can help. Herbert Gans, (in the Foreword to Cooper's "Easter Hill Village", 1975), puts it another way:

good user-oriented design can make life somewhat more pleasant and comfortable; design mistakes, including the mistake of ignoring user needs or wishes, can make people uncomfortable and even hurt them; but design per se cannot change people's lives significantly, for it cannot relieve poverty or the problems associated with it, or transform unhappy marriages into happy ones.

The notion of "possibilism" appeared (mainly in the field of geography) as a reaction against determinism. According to this view, the physical environment provides possibilities and constraints within which people make choices, based on other, mainly socio-cultural, criteria. Thus man is not seen as a passive recipient of environmental stimuli; he actively evaluates the opportunities offered by the particular environment and selects those to be pursued. (Moos, 1976, p.47).

A more recently proposed approach, and one which is currently most widely accepted in man-environment studies is that of "probabilism". This perspective, which bridges the gap between environmental causality and free will, recognizes that the physical environment provides possibilities for choice, that it is not determining, but that some choices are more probable than others in given physical settings. According to Rapoport (1977, p.2):

The most current view is that the built environment can be seen as a setting for human activities. Such settings may be inhibiting or facilitating and a particular setting may be facilitating to the extent of acting as a catalyst or releasing latent behavior but cannot, however, determine or generate [author's italics] activities. Similarly, inhibiting environments will generally make certain behavior more difficult, but will not usually block them completely, although it is easier to block behavior than to generate it.

The position which underlies all theoretical discussion regarding the man-environment interface in this thesis is that of "probabilism" as defined above, and operating within a dynamic whole-system context. The physical environment is part of a vast interacting system of socio-cultural, psychological and physical components, none of which is a pure cause or a pure effect. The effect of the physical environment on people must be assessed in the light of their psychological and socio-cultural characteristics.

The suburbs have been heavily criticized for being monotonous and repetitious environments giving rise to the emergence of the homogenized middle-class suburbanite. However, the conclusions of Peter Berger's study (1960) of working class residents in a suburb in San Francisco (referred to by Ittelson et al, 1974, p.349) refutes the notion that suburban housing by itself can change people's behavior and transform a non-middle-class lifestyle into a middle-class suburban pattern of living. In this study Berger found that the working-class residents who moved into this suburb retained, to a large extent, a style of living which was very similar to that practised in their former environment prior to moving. The effect of the housing and neighbourhood was thus filtered through a screen of socio-cultural factors.

The built environment is one of the less important influences on user satisfaction. Forces of culture, social class and other social relationships, and personality factors play a greater role in influencing human behavior and general satisfaction with one's environment. (cf. studies of user-satisfaction by Gutman and Westergaard, 1974). However, despite the fact that the built environment plays a relatively minor part in human affairs, it does play some part; it is this role of the built environment within the total human action system which needs to be explored, understood and defined.

3.4. THE EPISTEMOLOGICAL BASE OF ENVIRONMENTAL COGNITION

The investigation of environmental knowing implicitly bears upon certain general epistemological questions regarding the nature, validity and origins of knowledge. Two fundamental issues which underly an understanding of environmental cognition must be clarified:

1) how knowledge in general is attained, and 2) how this knowledge relates to reality.

Before proceeding with this task, the key terms, "reality" and "knowledge" will be defined. Berger and Luckmann, (1979, p.13) provide concise definitions. "Reality" is construed as:

a quality appertaining to phenomena that we recognize as having a being independent of our own volition (we cannot wish them away)

and "knowledge" is construed as:

the certainty that phenomena are real and that they possess specific characteristics.

The basic epistemological position adopted in this study is the constructivist position, based on Neo-Kantian theories of knowledge (as embraced and developed by philosophers such as Dewey and Bentley, psychologists such as Piaget and Werner, sociologists such as Mead, as well as others). The discussion which follows is informed by, and based largely on the ideas advanced by Moore and Colledge (1976, pp. 14-16).

The essential postulate is that "reality", in general, and of the physical environment in particular, is not given but is constructed by the subject through his active involvement with the environment. Whilst it is accepted that an empirical reality does exist, it is contended that there can be no direct access to this reality, but that reality can only be "grasped through the effort of particular minds" (p.14). Thus what is taken to be reality is a product of

the mental act of knowing, that is, reality is a construction of thought. Rather than assuming that knowledge can ever copy what is real, knowledge is treated here as, "constructed though intentional acts by an active organism from the interaction of sensation and reason" (p.15).

An example from the history of science which illustrates the way in which "reality" is determined by thought is found in the Ptolemaic-Copernican dichotomy. The Ptolemaic system postulated an earth-centred universe which implied, inter alia, a mobile sun revolving around a stationary earth. Copernicus rejected this and posited a helio-centric universe, that is, a static sun and revolving earth. It can be said that Ptolemaic man inhabited a different reality to Copernican man by virtue of their different theories, or mental paradigms.

Piaget (1954) gives empirical psychological evidence to support the constructivist position. He shows how the child's construction of reality proceeds by the complimentary processes of assimilation and accommodation, whereby stable mental structures, which filter and process every input, are developed. Epistemological relativism permeates Piaget's thinking about the construction of

reality. For Piaget, reality always involves a subjective element, in the sense that it is always, at least in part, a projection or externalization of thought or action.

Essential to Piaget's general theory of cognitive development is the contention that the child actively initiates environmental exploration, actively assimilates information and accommodates cognitive structures to enable new stimuli to be assimilated and comprehended, and in general, actively and spontaneously structures his experience and knowledge as he enters into a creative interaction with the environment. It is only by way of action (both bodily and mental), in an interactive process between the individual and his environment, that knowledge of objects and phenomena is possible (Piaget, 1954). To deny that there is a psychological reality without the intervention of the subject's activity is not to deny the separate existence of an external world. All that such a denial means is that all knowledge is mediated, rather than immediate (or copied directly).

Piaget's Interactionistic Model is taken further by Moore and Colledge (1976), who take a transactional-constructivist position:



The child enters into a creative
interaction with the environment.

(Clockwise, from above left):
22,23,24

Knowledge, or cognitive representations, are formed through an active construction of thought influenced by both the person and the environment and by the transaction between the two. (p.15)

It is assumed in this position that one does not start with a dualistic split between the organism and the environment (as is the case in primarily interactional theories, including Piaget's); rather:

what is taken to be the environment is not a reality defined independently of the observer, but a world established or constructed by persons in the context of ongoing transactions in environments. (p.15)

This transactional-constructivist position implies that reality is constructed by the individual in the course of his transactions with the environment. However, it is essential to note, that this position does not imply the absolute subjectivity or uniqueness of environmental knowledge: the construction of reality is a function of intra-organismic variables (i.e. what the person brings to the situation, including genetic and biological factors, personality factors and socio-cultural value and belief systems, etc.), and extraorganismic factors (i.e. external socio-physical situational demands), and their interrelations, operating in the context of ongoing transactions of the

organism-in-environment. Social and cultural forces thus play an extremely important role (if not the crucial role) in influencing the construction of reality.

The State of the Art of Environmental Cognition Studies

Interest in environmental cognition has become increasingly widespread in the last three decades. A review of the literature on the development of environmental cognition theory reveals six general tendencies.

- 1) Interest in the field has manifested itself in studies within a wide range of disciplines, including Economics, Geography, Anthropology, Sociology, Psychology, Urban Planning and more recently, Architecture. During the 1960's most of the work done in these different disciplines was conducted independently - there is little evidence of shared theories and methods across the different disciplines.

The fact that the common approach of explaining behavior as a function of subjective environmental conceptions has been adopted independently, and more or less simultaneously, in a variety of disciplinary fields, suggests that this approach has a considerable explanatory potential.

- 2) Most of the research conducted has been in the context of the large scale urban environment, particularly the city. There has been relatively little work in the field of environmental cognition in the smaller scale context of individual buildings.

- 3) Studies have generally concentrated on determining the structure and content of cognitive representations, schemata or images of the environment with very little attention or effort directed towards making explicit the nature of the relationship between the cognitive process and its products on the one hand, and, behavior and experience on the other.
- 4) Studies of environmental cognition are increasingly being considered in terms of their practical implications in relation to public policy, planning and design, e.g. geographers, Pocock and Hudson (1978) examine the potential value of urban and regional image-studies in the policy-making and planning process. Environmental psychologists such as Stringer, (1975) have similarly become increasingly interested in the relevance of their findings to environmental decision-making.
- 5) Many research studies are conducted without a firm and explicit theoretical base. This pitfall has, however, been recognized by certain researchers and in recent years there has been a marked increase in the development of theories aimed at guiding the search for an understanding of the relationship between behavior and experience, and the physical environment. (Parts 1 and 2, Moore and Colledge, 1976).

6) The research area of environmental cognition is characterized by a fundamental confusion over terminology. All research fields pass through an initial classification stage in which phenomena are identified, grouped, labelled and described, before a more stable and defined position is reached. Environmental cognition is still in this confused phase of its development, with its ambiguous and ill-defined terms, e.g. numerous terms such as "mental map", "image", "cognitive map", etc. are used to refer to cognitive representations of the physical environment.

4.1. THE FORTIES

The recent emergence of interest in the individual's subjective experience and mental representations of the physical environment was triggered off by 3 papers written in the late 1940's.

The first was written in 1945 by the sociologist and economist, Walter Firey; he contrasted the traditional role of economic and "social ecology" analysis in urban planning decision-making with the role of city "sentiment" and "symbolism".

In 1947 the geographer, J.K. Wright, called for the examination of the place of mental structures, particularly imagination, in the study of geography.

The third paper was by the cognitive learning theorist, Edward C. Tolman, in 1948. He coined the term "cognitive map" to describe the subjective representation of the physical environment housed in the mind of the individual and which mediates behavioral responses.

All three authors were concerned essentially with the role of subjective experience and knowledge of the large-scale environment in determining behavior in that environment, rather than the more traditional "objective" approach of science to explain behavior. In short, they postulated that behavior is mediated by the mental representation of the environment.

4.2. THE FIFTIES

However these studies were more or less isolated works and it was only in the late 1950's that the necessary impetus was given for a sustained and concentrated research effort which continues today in the field of man-environment studies.

The economist, Kenneth Boulding, in his seminal book, "The Image" (1956) postulated the theory that the image - defined as accumulated subjective knowledge - is the vital link between people and environment and is the key common variable in influencing all behavior. This work was a major stimulus responsible for the renewed interest in the notion of mental structures, that is, images, schemata, etc. of the environment. Boulding suggested the name "eikonics" as the name for the study of images. His thesis was that reality could not be directly apprehended but could only be reached via messages through a complex system of images. He argued that "for any individual organism ..., there are no such things as "facts". There are only messages filtered through a changeable value system" (p.14). He suggested that images are relatively resistant to change in their overall nature. It requires an accumulation of contrary evidence before a complete re-organisation can occur. He classified the concept of "image" into 10 dimensions (pp.47-48) which fall into two broad classes:- 1) value images and 2) factual and knowledge images.

4.3. THE SIXTIES AND SEVENTIES

Studies in the subjective experience and knowledge of the physical environment became increasingly widespread in the 1960's. Contri-

butions to this field of study came from a broad spectrum of disciplines, particularly Urban Planning, Geography and a number of the social sciences. Numerous academic subfields have been spawned in the past two decades by "parent" disciplines: Environmental Psychology, Social and Urban Geography in particular, have been investigating the role of environmental cognition in the man-environment interface.

This section will present a brief overview of some of the work done in the area of environmental cognition within the numerous disciplines concerned with this field of study:

Kevin Lynch's "Image of the City" (1960) has been cited as possibly the single most important influence on environmental cognition studies (Moore and Golledge, 1976, p.17). Lynch, an urban planner, explored environmental cognition on an urban scale, his concern being with how people understand the structure of cities and how they use them. He was particularly concerned with the notion of "imageability" of different cities which he defined as:

that quality in a physical object which gives it a high probability of evoking a strong image in any given observer. It is that shape, colour, or arrangement which facilitates the making of vividly identified, powerfully structured, highly useful mental images of the environment.
(p.9)

He interviewed residents from three major United States cities (Boston, Los Angeles, Jersey City). From the sketch maps and verbal answers to a set of questions, Lynch synthesized the responses into composite maps of the public image of each of the cities. He concluded that:

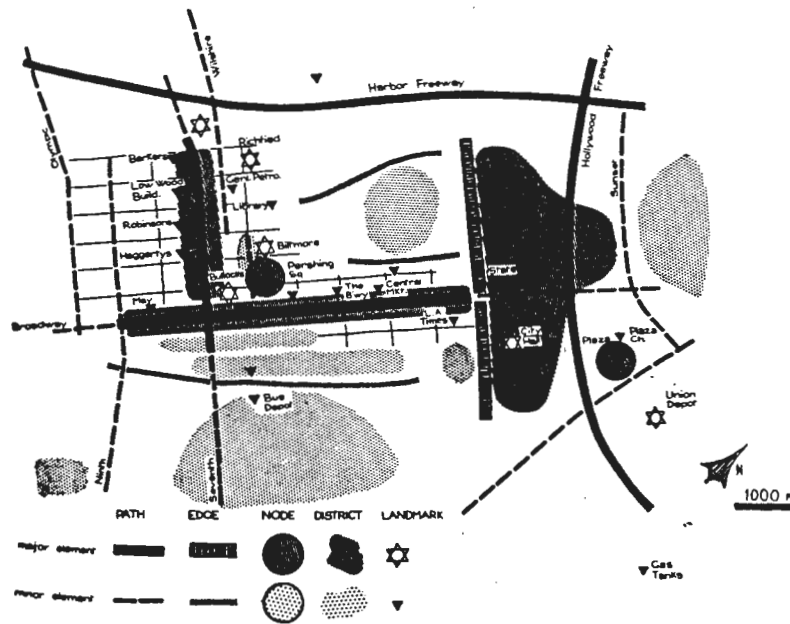
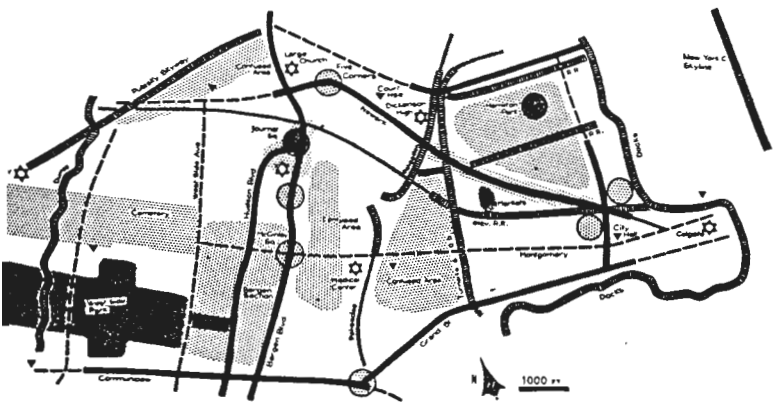
There seems to be a public image of any given city which is the overlap of many individual images ... Such group images are necessary if an individual is to operate successfully within his environment and to co-operate with his fellows. Each individual picture is unique, with some content that is rarely or never communicated, yet it approximates the public image, which in different environments, is more or less compelling, more or less embracing. (p.46)

In spite of subjective differences in the environmental images of his subjects he found that there were some regularities in the contents of the city images. These he classified into five types of elements: paths, edges, districts, nodes and landmarks.

Lynch's method stresses what people think their environment looks like in terms of the images that have become significant to them over a period of time. These images give people a sense of orientation, so that they know how to find their way around the city.



Aerial views of
 25 (far left) Jersey City
 26 (left) Los Angeles.



Lynch's analysis of the
 visual form as seen in the
 field of
 27 (far left) Jersey City
 28 (left) Los Angeles.

Images provide the group with a common memory of the environment in question, and to this extent enhance its meaning. According to Lynch, the "character" of a city is to a large degree its memorability manifested in the images it impresses on people's minds.

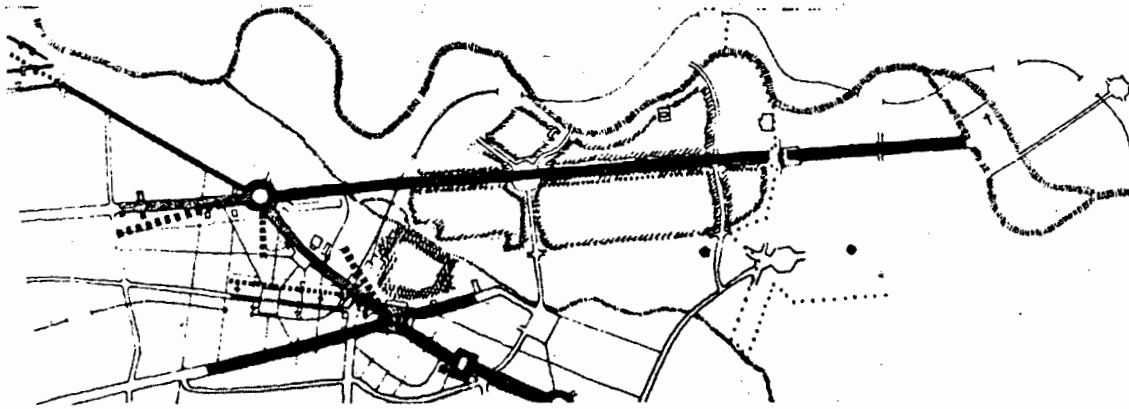
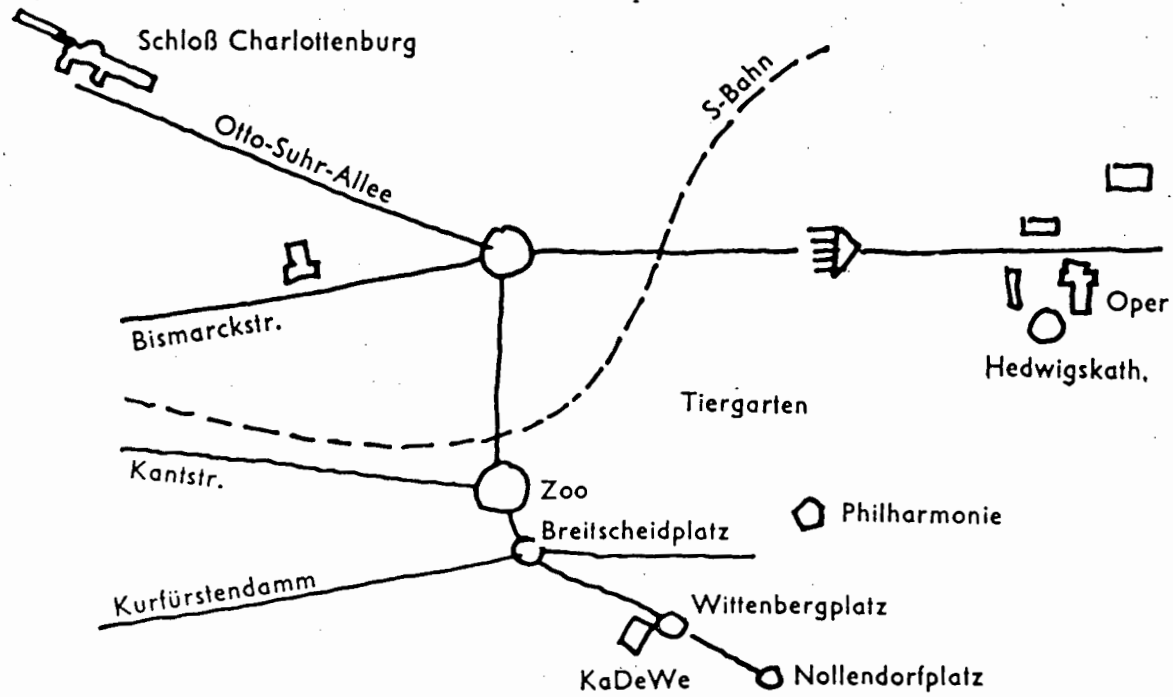
Lynch's work has had a great impact on large-scale planning and design theory and has pointed the way to the examination of what attributes of a given environment contribute to making it legible, understandable and pivotal for orientation.

Following Lynch's pioneering study a number of similar approaches to urban imagery have been undertaken which have generally confirmed his findings. Lynch's methodology and theory have been developed and expanded upon in the course of these research undertakings in various cities in different parts of the world.

One of the first studies which followed Lynch's work was conducted by Derk de Jonge in Holland in 1962 (report reprinted in Gutman, 1971). Lynch's findings were confirmed and enriched by this study. According to de Jonge, the imageability of urban form as represented by map drawings was generally stronger where the street plan had a regular pattern and where, as in central Amsterdam, there was a simple dominant

path, characteristic nodes and unique landmarks. In areas where, according to Lynch's method of analysis, the basic form was not highly legible, more attention was given in the sketch maps to isolated landmarks, individual paths and visual details. De Jonge also found that spatial orientation was easier in the more imageable areas and in the neighbourhoods in which the environment was not visually monotonous.

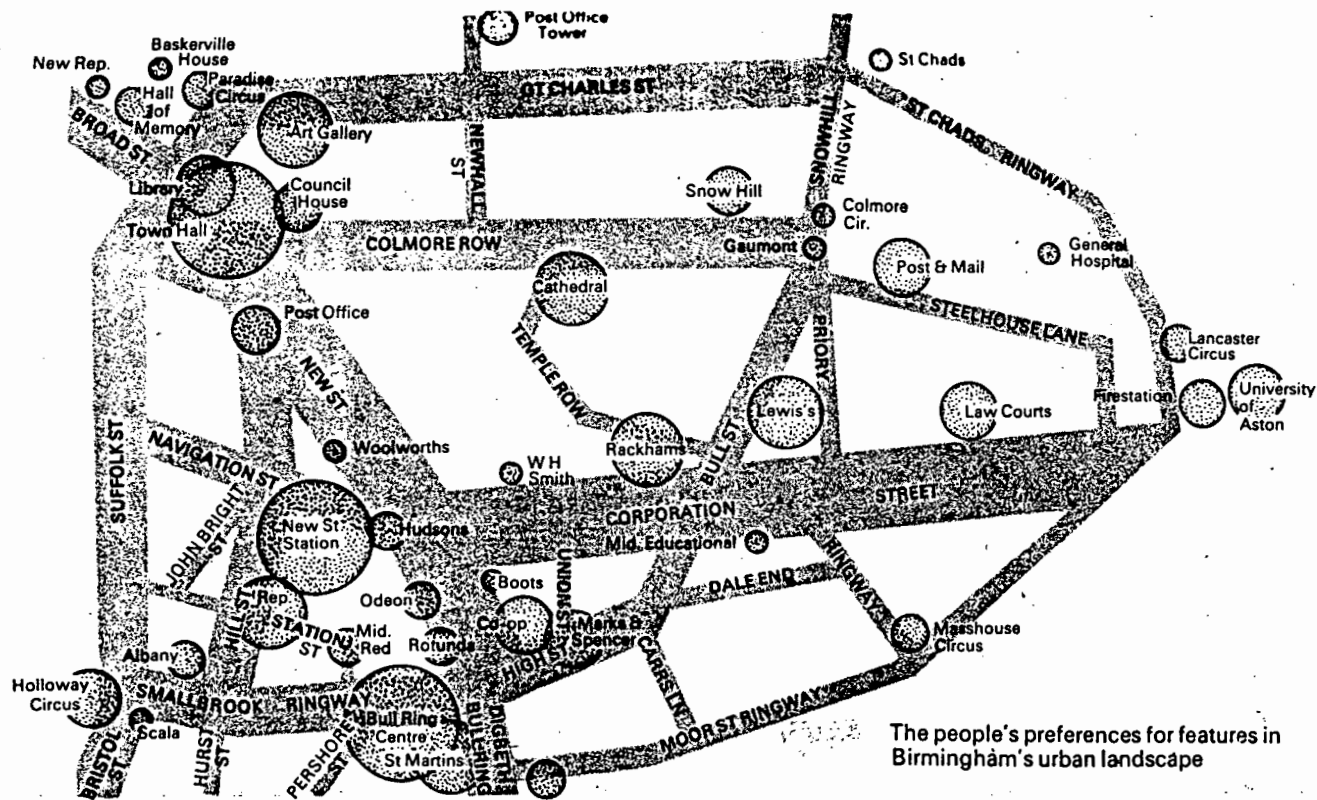
John Gulick (1963) investigated the public image in Lebanon. He found that Lebanese subjects combined both socio-cultural associations and visual form in the construction of their urban images. This finding that the image depends on more than visual criteria has since been confirmed in various studies: Thomas Sievert's studies in Berlin (1967, 1969) revealed that among children the clarity of the image and the memory of the city depended on visible signs of human activity and involvement in the urban landscape; small details with these characteristics were often more important and memorable than historical monuments or major buildings. Carl Steinitz (1968) found in his study, conducted in Boston, that memorable areas were those with congruence of form and activity. He also noted that the mode of travel played a role, so that motorists and pedestrians had different images.



29 Student's drawing of the town centre of Berlin with the characteristic elements of this drawing transferred to the map below (Sieverts).

Concern for the information people have about their city was translated into practical planning terms in Birmingham. Brian Goodey and his colleagues (1971) used the local newspaper as a means of recruiting subjects; readers were asked to send in free-hand sketch maps that conveyed the major impressions they had of the city centre. By combining the many hundreds of responses the planners were able to build up a weighted mental image that seemed to emphasize a marked preference for elements at a human scale. Some of the tall, physically prominent buildings were not found to be important features in the respondents' images. Many specific shops were mentioned because of street-level interest, while other areas were virtually blanks. This study proved very valuable to the planners who were involved in the Birmingham centre project.

Two studies by Donald Appleyard (1969, 1970) in the new town of Ciudad Guayana, Venezuela dealt with the question of cognition at two different levels: building attributes and overall city structure. In the first study - one of the few that deals with the environment at the scale of buildings - a selected sample of 320 residents were interviewed as to the ways they identified and recalled individual buildings. Appleyard found that the importance of buildings in mental maps seems related to their relative prominence, form, visibility and socio-cultural



The people's preferences for features in Birmingham's urban landscape

30 Weighted mental maps of central Birmingham as revealed by the study of Goodey et al.

significance. Congruence of physical use and significance patterns were important in cognitive schemata, as was naming. Major differences in schemata were found among various social groups. Individuals from the lower socio-economic bracket were found to have the more extensive schemata, a result of their wider movement through the city in seeking work. People from the upper classes had more limited orbits because they tended to confine themselves to their own areas. Appleyard concludes that:

the urban vocabulary of architects and urban designers, while it may serve some purpose, is in fact substantially incongruent with the public's urban vocabulary. (1969, p.155)

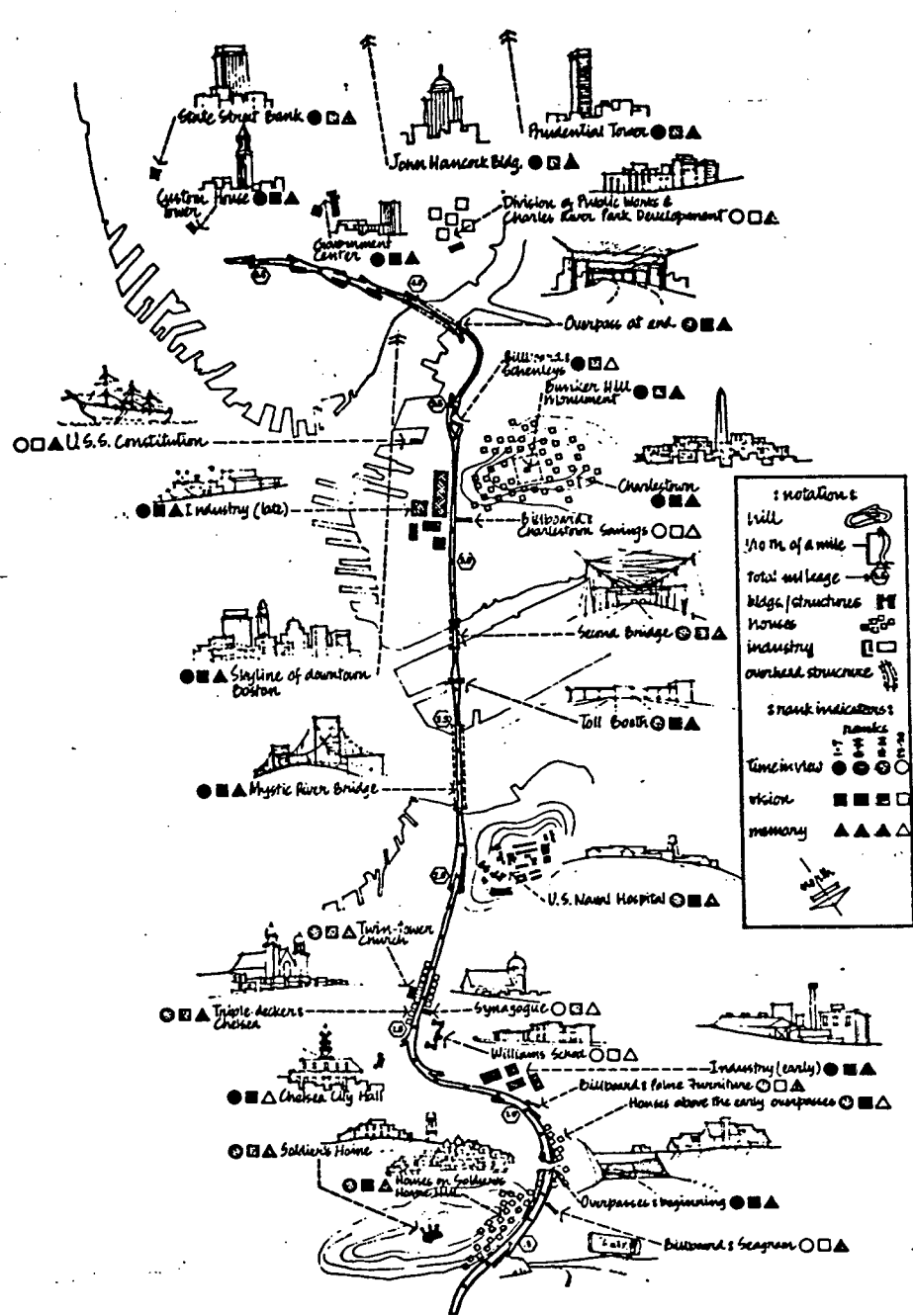
In his follow-up study of Ciudad Guayana (1970) Appleyard investigated the inhabitants' perception and mapping of the city as a whole. The majority of subjects produced maps where a predominant path system led to distortion of areas that were not adjacent to frequently travelled routes. Spatial conceptions of the city were not prominent but evidence of such elements was manifested in the maps of the inhabitants' local areas. Individual perception of distance was distorted by social significance - upper class inhabitants conceptualized themselves as living farther from the slum areas than they actually did

and closer to the desirable neighbourhoods. Appleyard concluded from his studies that three types of urban perception appeared to be dominant. These he identified as operational, responsive and inferential.

Stephen Carr and Dale Schissler (1969) examined those aspects of city form which were remembered by people moving through the city on an elevated expressway. They considered the ways in which people achieve, organize and transform sequential sensory experiences into cognitive environmental representations. They found that there was considerable overlap in the images of the three groups of subjects - drivers unfamiliar with the route, their passengers and regular commuters. The most significant finding of this study is the degree to which both perception and memory of the city, as seen from a highway, seem to be determined by the form of the environment itself. Further, this research demonstrates that perceptual and cognitive behaviour can be predicted rather closely by simple procedures which are accessible to city and highway designers untrained in psychology. This study complements Appleyard et al's well-known study "The View from the Road" (1964) which focusses on the aesthetic qualities of the highway trip.



31 Basemap of the Northeast Expressway, Boston.



32 Carr and Schissler's analysis of the dominant urban elements as seen from the Northeast Expressway.

Anselm Strauss's "Images of the American City" (1961) consolidated many ideas and gave direction to subsequent work on urban cognition from a sociological perspective. He argued that it was not possible to understand urban social behaviour in cities or the processes of development and urbanization without at the same time understanding what people think of their cities. Through literary, observational and sociological sources he has examined different group conceptions, shared sentiments and symbolism about urban and non-urban environments (1961, 1968).

The field of geography has contributed extensively to work on environmental cognition. Interest in man's knowledge of his environment is treated as a subsection of behavioral and social geography. However, it is only in the recent past, say since David Lowenthal's important article in 1961 that interest in environmental images has become more widespread within the geographical discipline. Lowenthal's essay on the theory of geographical knowledge is concerned with:

all [author's italics] geographical thought, scientific and other: how it is acquired, transmitted, altered and integrated into conceptual systems; and how the horizon of geography varies among individuals and groups. (p.241)

His study revealed the potential value of image studies in understanding man-environment relationships.

The image approach has been applied, either conceptually or empirically, to a wide range of topic areas within human geography. These include environmental hazard evaluation (Saarinen, 1966; Kates, 1962, 1967); retailers images of their operating environments (Harrison and Sarre, 1975); consumer images of their retailing environments (Downs, 1970); city images (as discussed above); regional and national images (Gould and White, 1974).

Roger Downs (1970) used the semantic differential technique (Osgood et al, 1957) to examine consumer cognitive evaluation of the retail environment in the city centre of Bristol. The author hypothesized nine "cognitive categories", each measured by four bipolar adjectival scales, as the dimensions by which shoppers evaluated the central area. Factor analysis confirmed six out of the nine hypothesized categories as distinctive dimensions of the image; these were price, range of goods, visual appearance, service, structure and design, shopping hours. Of the remaining three categories, "ease of movement and internal parking" was divided into two separate dimensions, but "reputation" and "atmosphere" were distributed across many of the

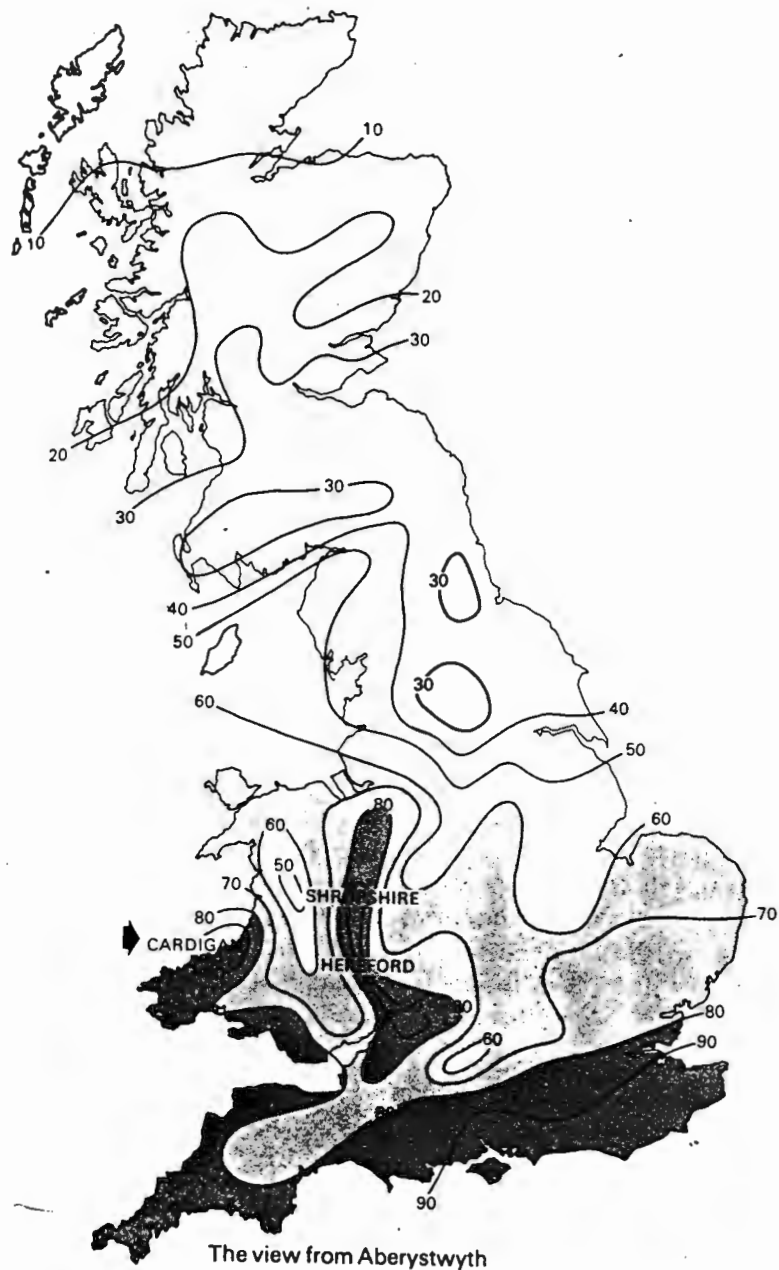
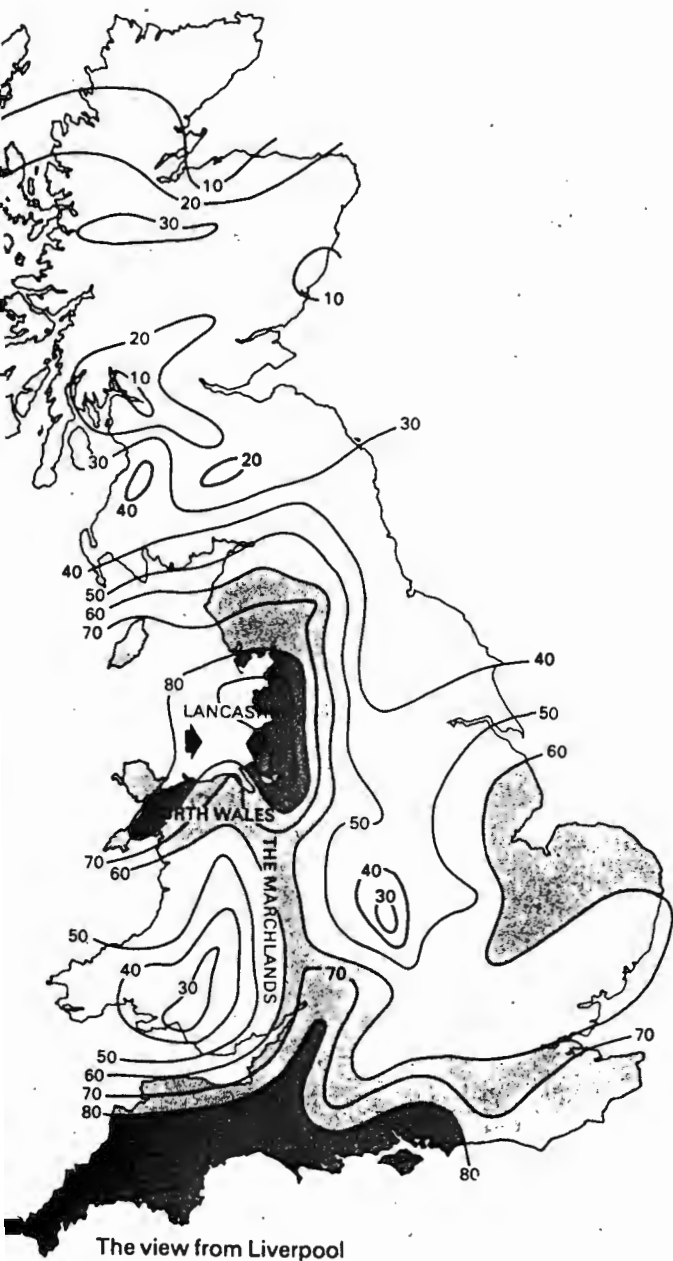
factors, such that "it might be argued that they do not exist" (p.36). This study also showed that consumers did not hold generalized images of centres lower in the shopping hierarchy, only perceptions of individual shops within the particular centres.

R. Hudson (1974), in a follow-up study of Downs' study, investigated images of individual food shops in Bristol using the repertory grid method (Kelly, 1955) to elicit the subjective construing of these particular environments. Without going into any detail, the basic idea of using the repertory grid is to enable respondents to generate their own personally meaningful and salient bipolar constructs to use in making ratings (whereas in the semantic differential method the researcher provides the constructs). Hudson was interested in the ways in which immigrant societies adjust to their new environment. Enlisting the aid of a number of postgraduate students in their first term at Bristol University and of undergraduates who had just moved out from halls of residence into "digs", he had ninety six students complete a food shopping diary for a ten-week period. Interviews were subsequently conducted with twenty six of this group and a grid was administered. Price levels and distance from the respondents' homes were found to be the most common and important dimensions of the shop image.

In a unique study of the evaluation of the retail environment from the point of view of the shopkeeper, rather than consumer, Harrison and Sarre (1975) used the repertory grid technique. Three distinct components of the environmental image were distilled from this study - one descriptive of the physical nature of the environment, another relating to the running of the shop and the third an evaluative bipolar split between objective and subjective elements.

Gould and White (1974) have surveyed the field of enquiry concerned with the mental maps that people form of the large-scale regional and national environment. They examined collective patterns of information, ignorance, learning and preference with regard to different geographical areas. They present accounts of the mental maps which inhabitants hold of different regions in Britain, America, Sweden, Southeast Asia and parts of Arica, drawing their information from numerous studies undertaken by themselves as well as others in this field. They include an analysis of the implications for the future of their findings.

Roger Downs and David Stea's book, "Image and Environment" (1973a) represents a significant contribution to the field of environmental cognition. This book comprizes a selection of papers, written by



Mental maps of England showing preference patterns of school leavers in
 33 (far left) Liverpool
 34 (left) Aberystwyth
 as constructed by Gould and White.

contributors from numerous disciplines, on the topics of cognitive mapping and cognitive maps. In presenting a structured overview of cognitive mapping and maps this relatively new research area was introduced to a wider audience. It is essentially a state of the art book aimed at presenting the reader with the origins, achievements and future of cognitive mapping research. Their article (1973b) analyzes the processes of cognitive mapping and relates the product of these processes, that is, the cognitive map, to adaptive and spatial behavior.

The developmental processes in environmental cognition have received considerable attention. Roger Hart and Gary Moore (1973) have provided a review and interpretation of theory and research on this topic. Relying mainly on the perspective provided by the work of Jean Piaget and Heinz Werner and his colleagues, Hart and Moore derived several conclusions concerning the development of spatial cognition in children. In addition to reviewing the literature, they have suggested a direction, consistent with the major theories of cognitive development, in which further investigations may proceed.

David Stea, together with James Blaut, has investigated the development of cognitive mapping abilities in children (1973). Their paper

attempts to provide the underpinnings for a general theory of cognitive mapping, drawing upon their own research findings and those of a number of other researchers. In earlier studies (reported in this article) they discovered that children as young as three to five years of age, can interpret features (and at least some areas) on black and white aerial photographs without any prior exposure to such photographs or any special training. Stea and Blaut interpreted these findings in terms of a developmental theory of spatial learning. This theory postulates that play with toys or miniature models, such as houses, animals, vehicles, gives children practice in the three essentials of mapping: 1) the use of a vertical perspective, 2) reduction in scale and 3) the use of symbols. They conclude their article with some implications of their findings for the design of environments for children and adults.

The prolific output of the architect-townplanner-anthropologist, Amos Rapoport (1967, 1973a, 1973b, 1976, 1977) has made a significant impact on the field of man-environment studies in general, and of the specific area of environmental cognition in particular. In his "Human Aspects of Urban Form" (1977) he takes a phenomenological perspective, dealing with the individual's and group's experience of the physical and socio-cultural environment. Rapoport is concerned here with:

how people experience cities, give meaning to what they perceive, how they understand the city and organize it conceptually, how they give identity to environmental elements and how they behave as a result of this, how designed environments reflect ideal images and how they affect behavior, how choices are made and on what basis.
(p.6.)

He postulates a "filter model" for linking "real world choices" and final subjective choices made and given expression in the built environment. His diagram suggests that filters (cultural, personal and other possible filters) and the resulting different perceived environments within which people act - the different perceived possibilities, criteria and choices - are intimately linked to images. Rapoport uses many cross-cultural references to support his arguments.

Studies concerned with national and regional images and urban images have been discussed above. This review now turns its attention to the work which has been done in the field of environmental imagery in the smaller scale environment - the neighbourhood, building and room.

The systematic study of the definition of neighbourhood began with the British environmental psychologist, Terence Lee (1968) and has

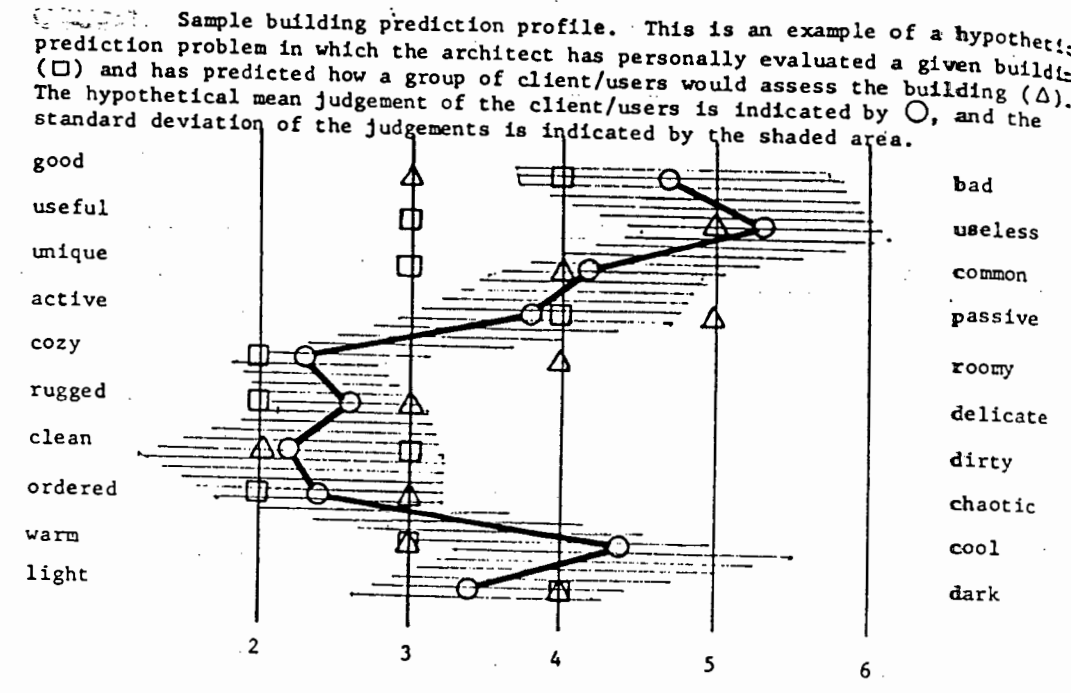
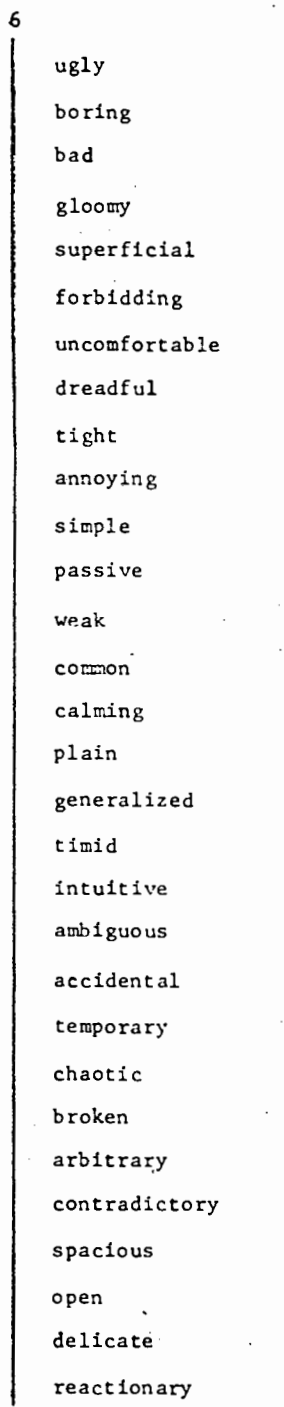
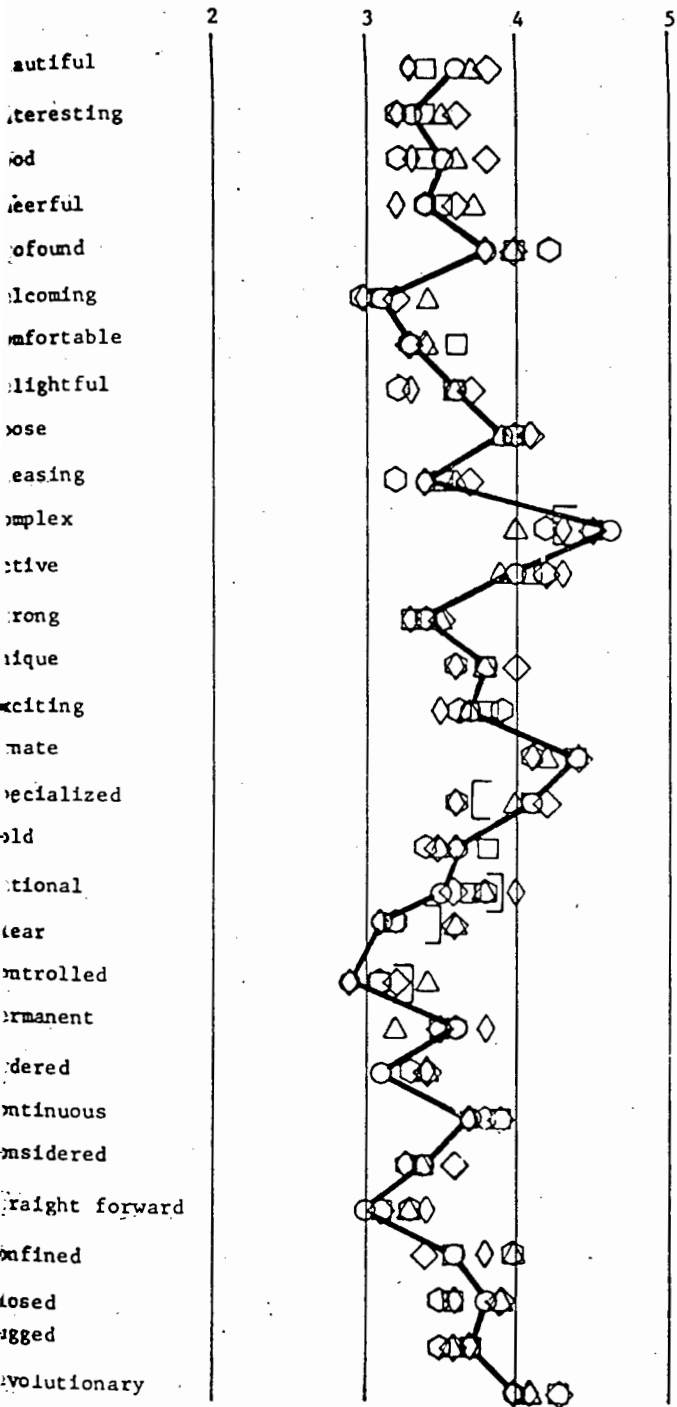
proved to be very influential. Adopting an inductive empirical approach, he found that respondents defined their neighbourhood in both physical and social terms. Lee used the concept of the "socio spatial schema" to represent the neighbourhood image.

While the content of schema varied individually in size and shape, based on personal experience, Lee found that they could be generalized for various groups. He found that the size and make-up of the subjective neighbourhood is a function of numerous factors: the physical environment, name, symbolic elements, and group behavior and characteristics (Lee, 1971). Among important social variables were friendship networks within the locality and local club membership; the use of local shops was positively, but not significantly, related to neighbourhood definition due to the wide use of such shops generally, in the English context. Among important physical variables were the number of houses, shops and amenity buildings encompassed by the area (Lee, 1968, 1971).

Robert Hershberger has conducted considerable research in the area of architectural meaning. His initial research in this area focussed on whether or not there is a correspondence between architects' comprehension of architectural environments and that of laymen,

and if not, to discover to what this difference could be attributed (1970a). In this study semantic differential scales and single colour slide representations of familiar buildings were employed to elicit judgements from architects, pre-architects and non-architects. Pronounced differences were found between the architects and non-architects. Hershberger suggests that it is the architects' professional education that plays an important role in influencing the cognition of the architectural environment. The most important aspect of this study is Hershberger's introduction of a tool by which affective responses to architectural environments may be systematically identified and so aid the architect to understand his clients' preferences.

His later research has continued to be directed toward the end of improving the architect's ability to make pre-construction predictions and to develop research instruments which can be used to attack the prediction issue directly. Hershberger has conducted numerous studies in this field: 1) he has made further comparisons of the environmental comprehension of different groups of people (1970b), 2) he has considered problems relating to the adequacy of various media to represent the architectural environment in experimental research (Hershberger and Cass, 1974) and 3) he has attempted to



Experiment 1 Media Profile. The mean responses on each of thirty semantic scales are plotted for judgements made during real visits and with respect to each of five representational media for twelve prototypical housing examples. ○ Real visits, □ super 8 mm color film, △ super 8 mm black and white film, ◇ 35 mm angle color slides, ○ 35 mm multiple color slides, ◊ video tape.

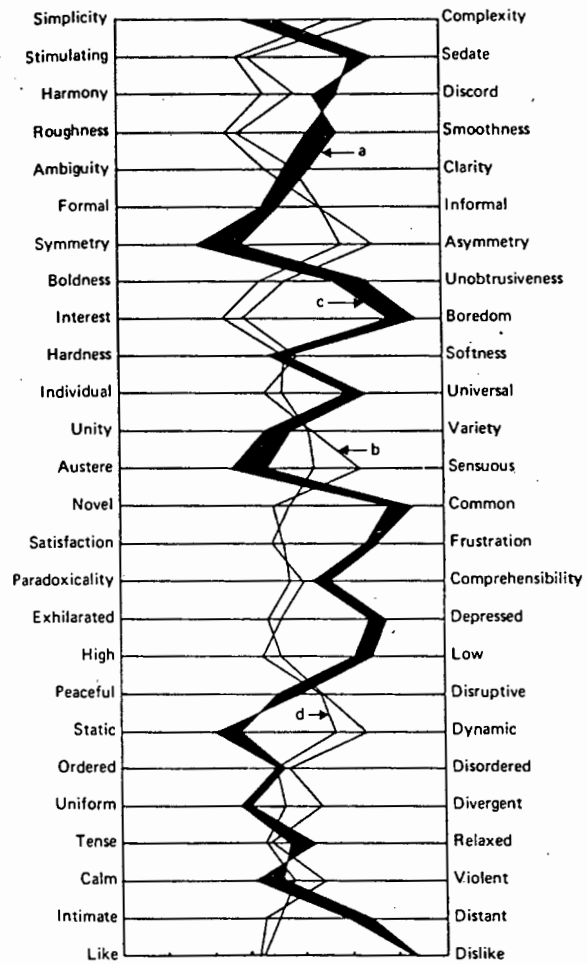
35 (left) Media profile drawn from Hershberger and Cass' study of the adequacy of various media to represent the architectural environment in experimental research.
36 (above) Building prediction profile.

develop a comprehensive set of semantic scales applicable to designed environments (1972).

Henry Sanoff (1974) has recognized the need for knowledge of environmental perceptual phenomena. In this article he describes an experiment he conducted which focusses on the ordering of visual attributes of the architectural environment through the use of bipolar semantic differential scales. Two groups - experts in design and research and graduate students of planning - were asked to describe an ideal environment and to rate visual displays on these scales. The results reveal that there is ambiguity inherent in our language and strong value associations with the connotative meaning of words.

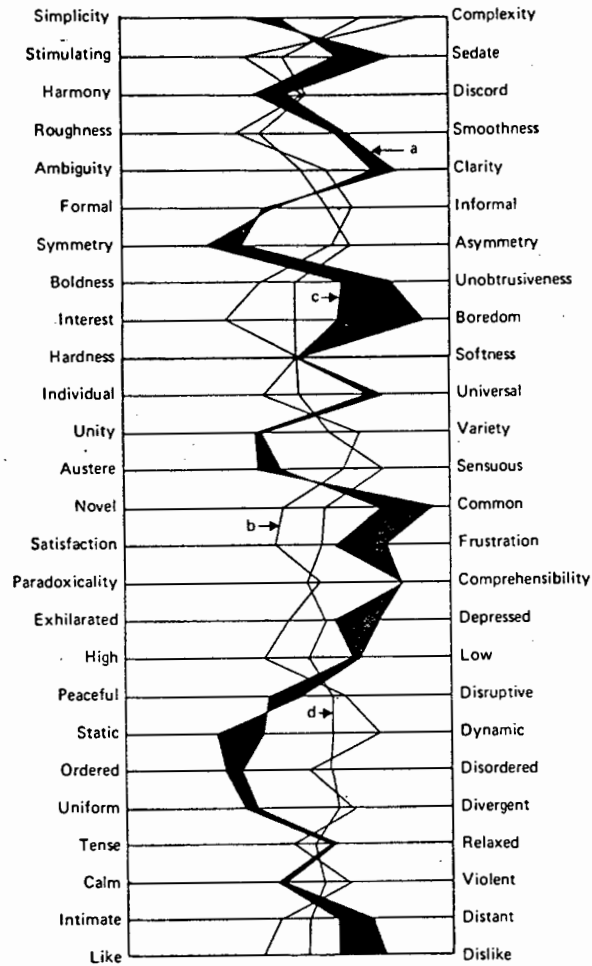
Kelly's Personal Construct Theory and his repertory grid technique (1955) were first introduced to architectural psychologists by Peter Stringer (1970) at the Dalandhui Conference. His exhortation was not restricted to the value of Kelly's theory and methodology for research; he stressed the advantages for both psychologists and architects of adopting in practice the flexible "constructive alternativism" advocated by Kelly. This attempt to "reconstrue" the world in ever new ways would help in mutual understanding and it would also deliver them from the mere attempt to reproduce the environment of the past.

Group 1 (Architects)



Arithmetic mean distribution for environmental displays a/b/c/d

Group 2 (Students)



37 Results from Sanoff's study which uses semantic differential scales to measure attributes of the visual environment.

Instead of merely designing so as to preserve the particularities of men he has observed, [the architect] can design so that [men] reconstrue the world, change and become new men. (p.9)

Interest in Personal Construct Theory (PCT) and more particularly in the repertory grid method of measurement, has grown rapidly in the field of environmental cognition. Certain applications of this research method have already been mentioned earlier in this chapter in connection with urban imagery. Basil Honikman (1973, 1976a, 1976b) has written extensively on the use of Personal Construct Theory as an approach to architectural and environmental design. One of his first empirical projects, using the repertory grid, was the Kingston living room study (1976b) where his objectives were to explain the meaning that seventeen different living rooms (represented by colour photos) had for a person in terms of their physical characteristics. In other words, if someone felt that a particular environment was comfortable and liveable but unfriendly, Honikman's study aimed to discover which aspects of the design, its materials and arrangements, contributed to this feeling. The methods and techniques of the living room study were used in two studies of housing carried out by the human environment program at the University of Kansas. These two projects are reviewed by Honikman (1976b).

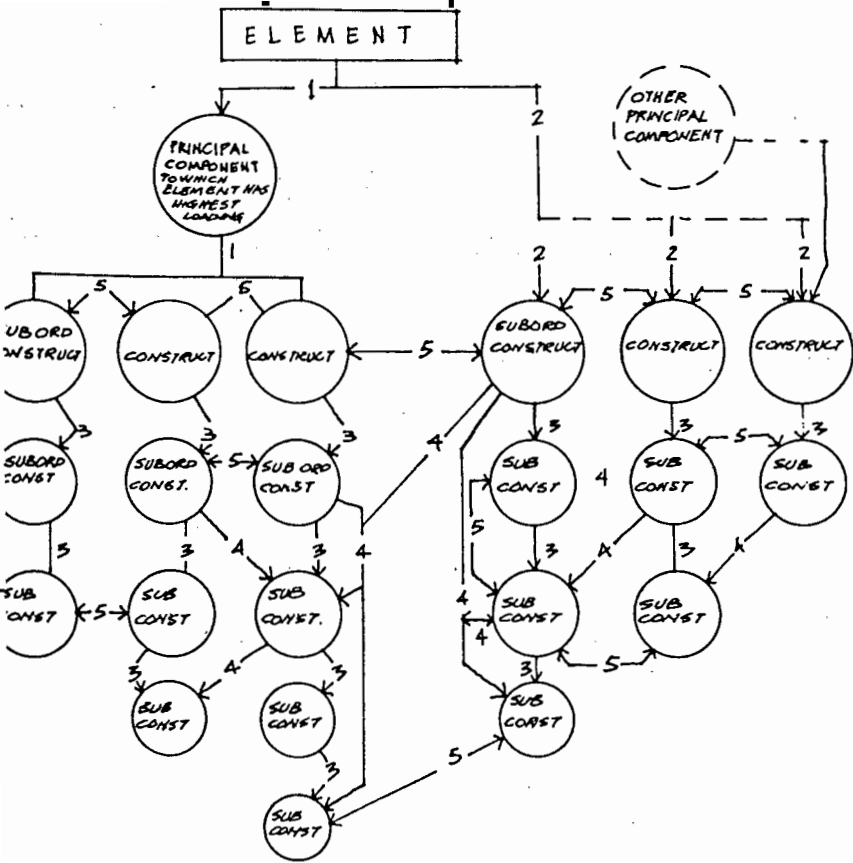


FIGURE 1
Simplified linear link diagram, demonstrating the linking of elements through principal components to constructs.

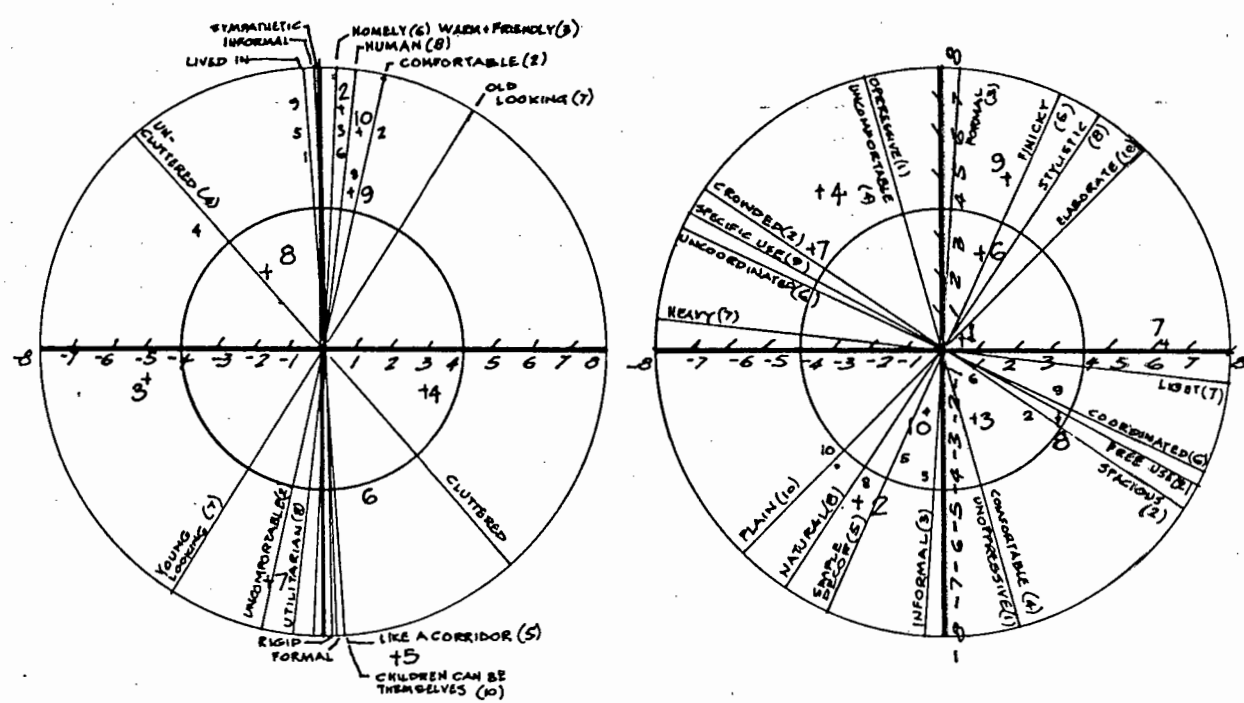


FIGURE 2
Construct-space diagrams for elements in the construct space: left, informant 6; right, informant 29. The heavy axis lines represent the principal components and are divided into scales of eight units. The light lines are the construct lines representing dimensions running between the opposite poles of each construct; thus +9 is the location in the construct space of element 9.

38 Diagrams from Honikman's Living
39 Room Study which uses the
repertory grid method.

Probably the most prolific British writer and editor today in the general field of man-environment studies is David Canter (1969a, 1969b, 1970a, 1970b, 1973, 1977; Canter and Lee, 1974; Canter and Springer, 1975). He has also written specifically on environmental cognition and conducted numerous empirical research projects in this area. His book "The Psychology of Place" (1977) is concerned with the psychological processes that enable people to understand places, to use them and to create them. Canter contends that our conceptualization of a situation may be thought of as producing, or at least influencing, our behavior. The essence of his argument, - which has its origins in the work of Mead (1934), Kelly (1955) and more recently, Harré and Secord (1972) - is that any act is made in relation to the context within which the individual thinks himself to be. In studying the cognitive systems pertinent to the environment, Canter attempts to develop a theory which explains and describes the structure of these conceptual systems. This is an interdisciplinary exercise where he draws upon the theoretical formulations of theorists from numerous disciplines - Boulding, the economist, Bartlett, the physiologist and Lynch, the urban planner. The second major theme of this work is Canter's examination of the methodological procedures available for examining the cognitive processes involved in the comprehension of place.

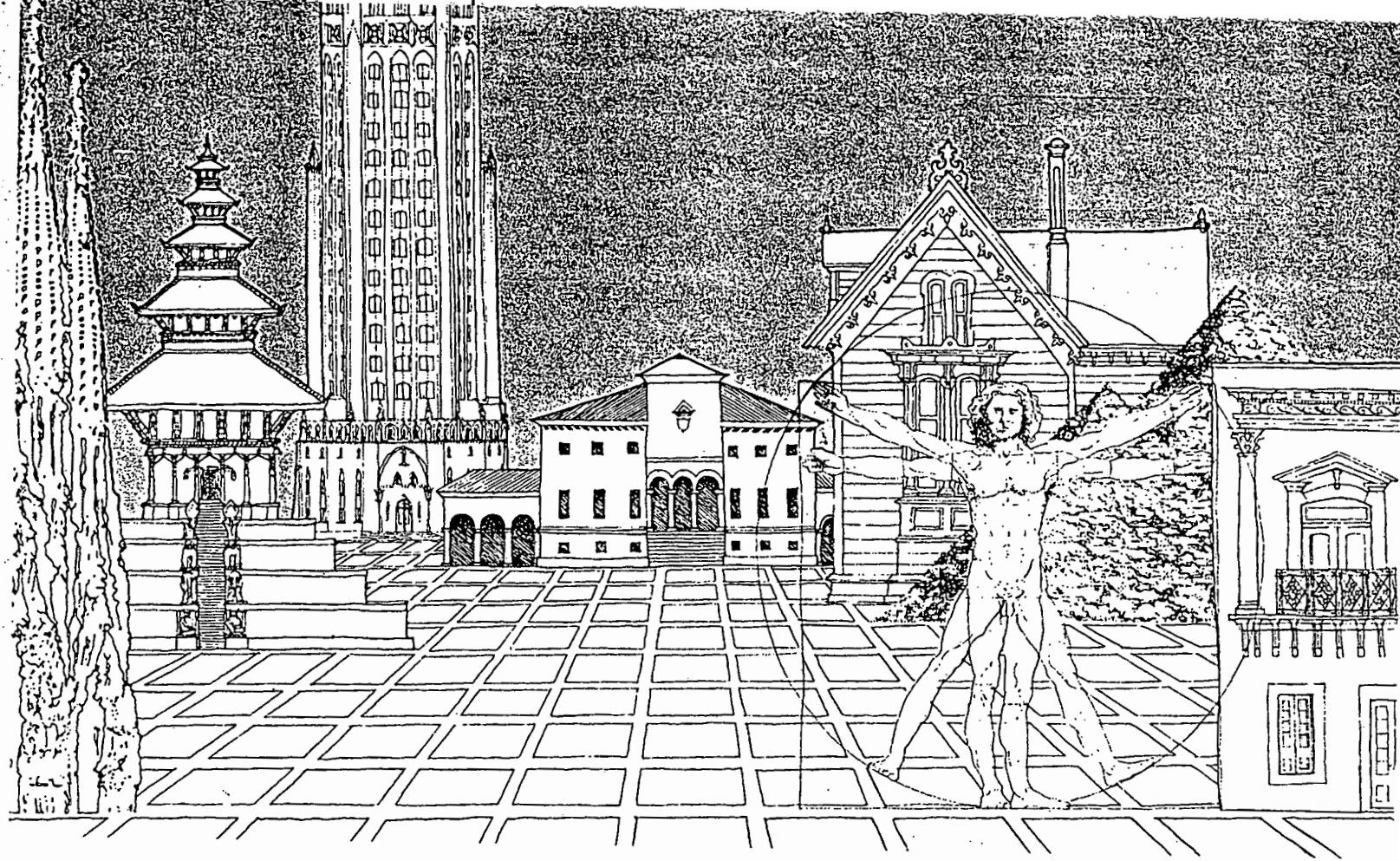
In the United States, the work of Harold Proshansky and William Ittelson and their colleagues (1970, 1974) has made a very significant impact on the general field of man-environment relations. Whilst their work does not focus on environmental cognition specifically, it does recognize the vital role of cognition in man-environment interaction. In their comprehensive work, "An Introduction to Environmental Psychology" (Ittelson et al, 1974) they devote a chapter to a discussion of how people perceive the environments within which they live. This chapter is based largely on the earlier work of Ittelson (1973) where he specifically investigates the relationship between environment and cognition. In this work Ittelson takes a holistic approach to man and his environment, defining their inter-relationship as "transactional":

All parts of the situation enter into it as active participants; and these parts owe their very existence as encountered in a situation to such active participation - they do not appear as already existing entities which merely interact with each other without affecting their own identity. (Ittelson, 1973, p.19)

Ittelson, Franck and O'Hanlon (1976) have produced a paper which

investigates the nature of environmental experience. They describe a methodology for the study of environmental experience that is based on the fundamental premise that environmental experience and environmental action cannot be separated and that environmental experience is that continuing product of an active endeavour by an individual to create for himself a situation within which he can optimally function and achieve his own particular pattern of satisfaction. Three empirical studies which they conducted are reported in this paper. The results of these studies indicate a number of characteristics of environmental experience and specific modes of experiencing the environment.

The significance of the human body in the experience of architecture is examined by Kent Bloomer and Charles Moore (1977) who contend that the body is the source of a personal world which generates many of the meanings by which we experience the physical environment. In arguing that body experience and memory are closely linked, they stress the importance of memory as part of our existence in the environment. Various models of perception that have been influential in the twentieth century are reviewed, with particular attention being given to the implications of body-image theory and the recognition and development of the haptic sense. Numerous architectural examples are

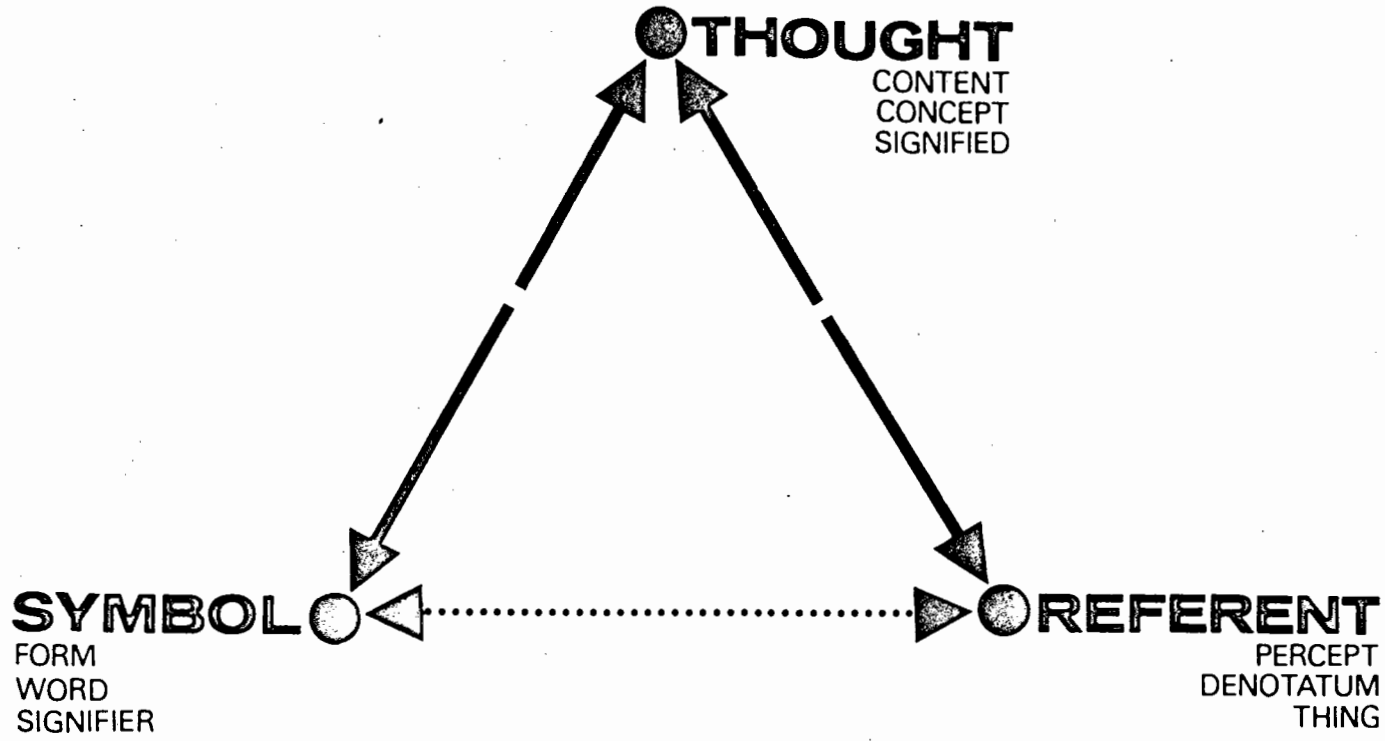


40 Bloomer and Moore examine the significance of the human body in the experience of architecture.

analyzed in an attempt to substantiate their theoretical formulation. They develop their main thesis that all achitecture at its beginnings derived from a body-centred sense of space and place, and that it is only in relatively recent times, with the increased emphasis on the rational and cerebral approach to design, that the relevance of the human body is no longer central to architectural thought.

The question of meaning in architecture has been approached by Charles Jencks (1969) who argues for the application of "semiology" - the theory of signs - to architecture and urbanism. His argument is based on the "semiological triangle" which links language (or symbol), thought (or concept) and reality. He applies this linguistic model to describe the communicative dimension of architecture. Jencks postulates the notion of mental schemata, or concepts, which determine environmental perception.

Christian Norberg-Schulz' (1971) treatise on the problem of architectural space is cognitively orientated. Basing his argument on a theory of existential space, he proposes the idea that architectural space can be understood as a concretization of the environmental schemata, or images that form a necessary part of man's general orientation in the world. He draws on the theory and research of Piaget to support his



contention that the individual acquires various schemata which mediate a three-dimensional world, and which together make up man's "image" of his environment. Existential space is defined as a relatively stable system of perceptual schemata, or "image" of the physical environment. Norberg-Schulz' work represents one of the few contemporary attempts to develop a comprehensive theory of architecture. His basic motivating intention is to establish "a simple and useful key to the architectural totality" (p.7).

The above review has drawn on work in environmental cognition from a wide spectrum of disciplines. Studies which are both relevant in themselves and which have contributed to the development of the research field, have been included here. Whilst giving a broad overview of the state of the art of environmental cognition studies and a background context within which the following chapters are couched, this review by no means represents a definitive description of the field.

Cognition and the Man- Environment Interface

5.1. THE COGNITIVE APPROACH

5.1.1. A working hypothesis for conceptual analysis

Any concern with built environment and how people influence and are influenced by it has at its roots the question of how this environment is cognized, or known as an environment. A working hypothesis for conceptual analysis is postulated; this serves as the point of departure for building up a framework by which to study man-architecture relations. This hypothesis proposes that the single psychological process most critical for man-environment interaction, and one that underlies all human response to the built environment, is that of cognition.

A number of assumptions underly this hypothesis:

- 1) A fundamental presupposition is that the process and products of the cognitive mechanism of a person influences his behavioral response and experiential reaction to the physical environment. The corollary to this is: the influence of the environment on a person is determined by his cognitive structures. Following the constructivist position on epistemology outlined in Chapter 3.4., knowledge of the environment is acquired through an active and creative interaction of the subject with the

environment, whereby the object, in this case, the built environment, is construed by the subject in his own way. In this sense, the environment is what we think it is and we thus respond to it as we conceive it to be.

Steven Carr (1967) supports this view of the role of human construals or conceptions of the environment in structuring reality:

the city is what people think it is. The city that we know personally - the city of the mind - largely determines the world in which we have our life experiences and through which we strive to gain many of our daily satisfactions. (p.199)

- 2) It is assumed that a more profound understanding can be reached of people's actions, needs, attitudes and desires with regard to built environment if the way that they conceive of that environment is made explicit. This assumption concurs with Stacey's (1976) contention that:

If people believe in, and act upon their information, notions and stereotypes as obviously they often do, then it is necessary to have knowledge of their subjective reality and to relate it to what is known of the objective reality. (p.120)

We need to find out what images, symbols, and meanings are attached to elements of the built environment, such as different housing types and styles, use of open space and planting, demarcation of private property, etc. The findings thus generated will contribute to the general level of understanding of the relationship between people and their environment. This knowledge can then be used to inform the design process, thereby increasing the potential for designers to create environments for people which are congruent with what the potential users would take to be an improved quality of life.

- 3) Whilst it is accepted that peoples' cognitions of the environment are influenced to a large extent by what there is to be cognized, that is, the "objective reality", the position is held that cognition (as a process of the subject), mediates between subject and object and determines to a large degree human behavioral response and experiential reaction. The stimulus, that is, the environment, is a trigger, and the response is a function of the individual's cognitive structure.

The "anti-architectural determinism" position has been dealt with in Chapter 3.3. where the concept of "probabilism"

(Rapoport, 1977, p.2) was introduced. This suggests that the environment, viewed as a setting for human activities, provides possibilities for choice but that some choices, in a given physical setting, are more probable than others. The influence of the environment is mediated by the cognitive "filter". Thus it is not the actual physical elements of architecture that determine particular responses, but rather the way that they are structured by the human mind in the process of cognition that determines the response.

5.1.2. Subjective orientation

The cognitive approach emphasizes the internal processes of the individual in his intercourse with the socio-physical environment. It is concerned with the subjective manner of construing the built environment, rather than with the objective reality of that environment. It deals with the relevance of such mental representations to individual and social experience and behavior. It investigates the social and psychological, rather than the neurological and physical aspects of getting to know the environment.

Interest in the subjective experience of the environment has in recent years increased. (e.g. Bloomer and Moore, 1977; Norberg-

Schulz, 1971, 1980; Jencks, 1969; Tuan, 1974, 1977 and others.)

This humanist approach seems to be a direct response against the so called "objective" or "factual" approach taken by science which still operates largely in the Positivistic paradigm.

Although the subjective-objective dichotomy has been debated by philosophers through the ages, this recent upsurge of interest in a subjective or person-oriented approach, which is concerned with understanding meaning structures, images, attitudes, beliefs and values regarding man's physical surroundings, can be traced back on a relatively recent time-scale to Husserl's far reaching and influential Phenomenology. This philosophical standpoint was developed by Husserl in response to his argument that the modern world, particularly positivist science, had reduced man to an object in an objectified world (Husserl, 1965).

This so called "objective" view of the world demanded by science is reflected in numerous disciplines: the behaviorist model used in psychology; the logistical models used in sociology; the economic model used in geography; and in a sense, the Modern Functionalist Movement in architecture which attempted to reduce architecture to "a set of minimum dimensions" (Norberg-Schulz,

1969, p.226) supported by scientific data.

This study, which attempts to investigate and understand the physical environment as it is subjectively cognized and experienced by the individual within his socio-cultural context rather than the physical world "as it really is", is thus in a broad sense phenomenological in orientation. However, the phenomenological method itself is not followed.

5.1.3. The distinction between object- and environmental cognition

Most of the research carried out in the field of cognition and perception has been in the context of object perception. However, objects are not environments and environments are not collections of objects: "Environments provide much more information than that necessary for the perception of objects and their spatial relationships." (Ittelson et al, 1974, p.103). The Gestalt reaction against atomistic psychology recognized the importance of context and emphasized the behavioral environment. In this sense the Gestaltists come close to studying environmental cognition (or perception). However, Gestalt perceptual theory did not focus on the environment but was primarily developed through the study of form and object perception.

In dealing with the cognition of objects, a set of circumstances prevails which is inherently different and opposed to those of environmental cognition. The subject-object dichotomy of object cognition does not apply in environmental cognition; one is not a subject of an environment, but rather a participant in it. The cognizer does not stand apart and separate from the environment, but rather he forms an active and integral part of the surrounding environment. Ittelson et al (1974) confirm this point:

There is only the total environment of which man is one kind of component in relation to other kinds of components. The very distinction between person and non-person breaks down. The environment surrounds, enfolds, and no thing and no person can be isolated and identified as standing outside of and apart from it. (p.104)

5.1.4. The distinction between cognition and perception

The terms "perception" and "cognition" have been applied in a confusing variety of contexts by different psychologists and other behavioral and social scientists. It is thus necessary to define the usage of these terms in this study.

Traditionally, psychology has viewed perception and cognition as

two separate and isolated systems with certain fixed and unidirectional contacts between them. However, the current view in psychology, although there is some disagreement, is that it is difficult to separate perceptual and cognitive processes (e.g. Gibson, 1968, Chapters 12 and 13; Ittelson, 1973, p.10; Moore and Colledge, 1976, p.6). The view that perception is the passive reception of information and stimuli from the environment which is subsequently structured by the mind in the cognitive phase, is no longer accepted. Rather than passively accepting the bombardment by sensory data, people actively search the environment for meaningful information. (This is discussed in more detail in Chapters 6 and 7.) Perception and cognition are thus seen as forming one "perceptiocognitive" system whose fundamental function is the processing of information.

Although the distinction between perception and cognition falls short of forming a clear dichotomy, but rather fades into differences of degree and focus, certain relative distinctions can be made. Perception has a more direct sensory referent than cognition. It is stimulus dependent and involves an immediate behavioral response, whether overt or covert, to energistic sensory impingements (Moore and Colledge, 1976, p.6). However, as Moore

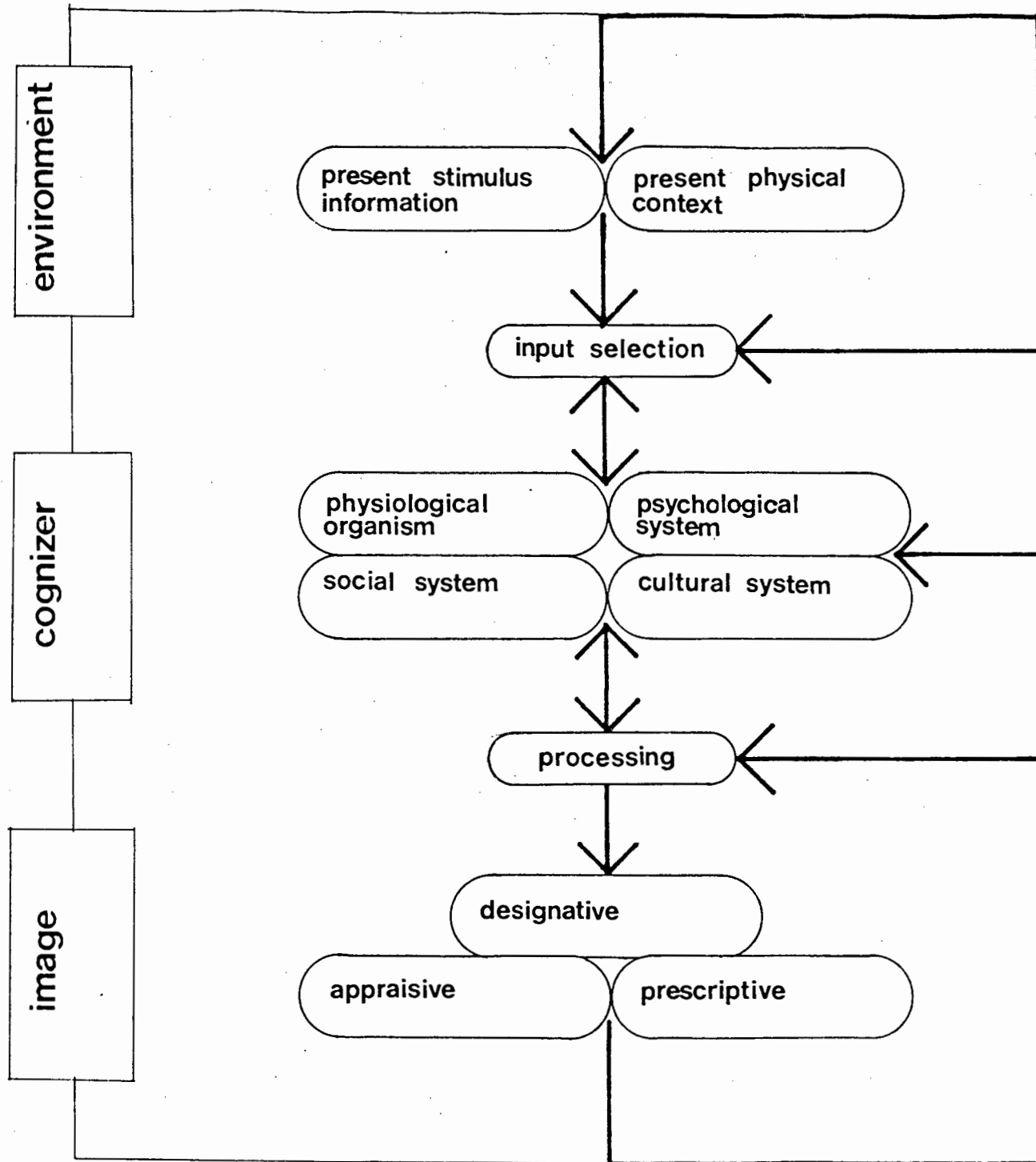
and Golledge point out, most perceptual tasks require an interval between stimulus presentation and response, if for no more than the comparison of the task and the standard in the most simple of perceptual situations; "it thus may be questioned if anything like pure perception ever occurs without cognition" (p.7).

Cognition is the more general term and refers to all the modes of knowing that mediate between the external world and human response. It includes the processes of thinking, remembering, judging, imagining, reasoning - and perceiving. Perception is one of the means by which information from the environment is processed and made known to the individual; at the same time perceptual activity is influenced by memory, judgmental processes and other cognitive structures and processes. Perception can thus be treated as a sub-system and as a function of cognition. This approach to perception is widely held amongst contemporary theorists, such as Piaget (1969); Wapner and Werner (1957); and Downs and Stea (1973b). Moore and Golledge (1976, p.7) cite numerous examples of experiments which support the notion of the subordination of perception to cognition.

5.2. OVERVIEW OF A CONCEPTUAL MODEL OF ENVIRONMENTAL COGNITION

A theoretical model is a mental construction which describes complex systems or events in simple terms so that they can be more easily understood. Since models are human constructions, they contain only those aspects, dimensions or concepts which their authors choose to put into them. Different models based on different fundamental assumptions can be built to describe similar phenomena; their validity lies in their usefulness to explain, order and predict.

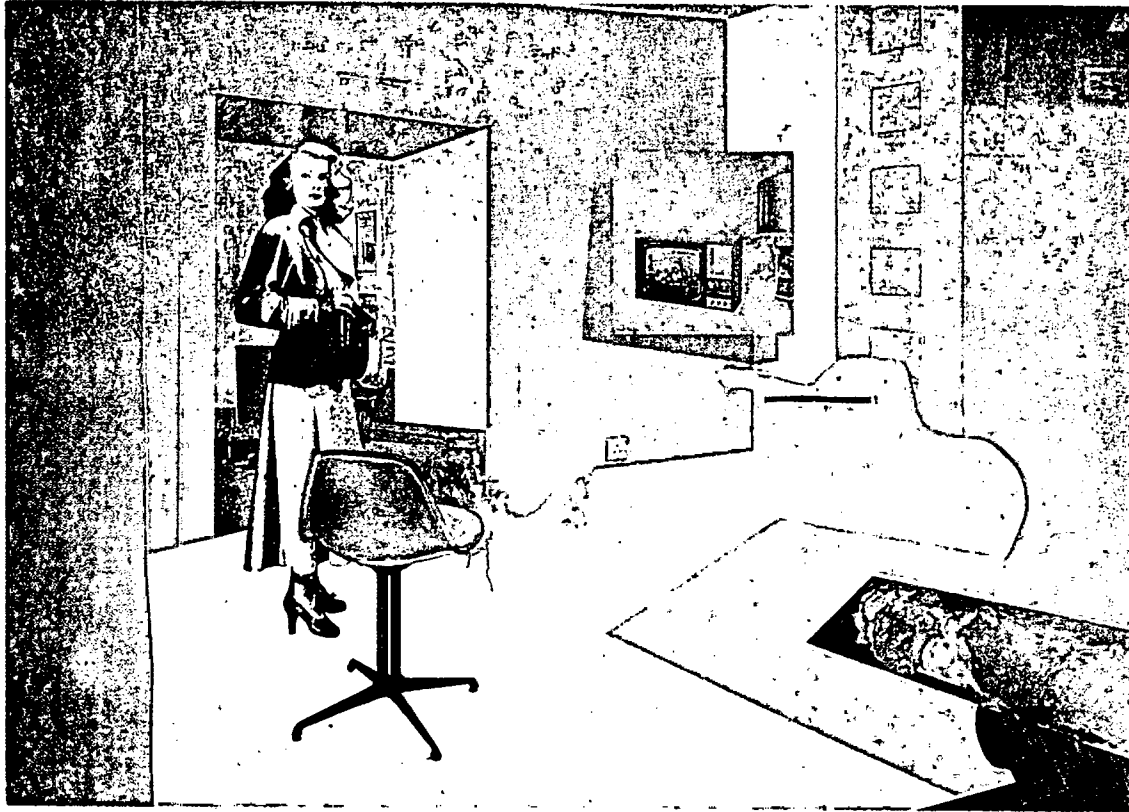
A particular conceptual model of environmental cognition is proposed here which attempts to explain the complex transactional nature of man's relationship to the built environment. It is based on, and represents an expanded and adapted version of the model of environmental perception advanced by Pocock (1973). It deviates from Pocock's model in several ways, the most significant differences being the projection of a transactional rather than a simple interactional relationship between man and the built environment; the use of the term "cognition" rather than "perception" (cf. Chapter 5.1.4.); and the emphasis of the social dimension in the human component. The component parts of environmental cognition and their interrelationships are summarized in a schematic diagram representing a model of environmental cognition. The components are discussed



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 DIAGRAM OF A CONCEPTUAL MODEL OF ENVIRONMENTAL COGNITION

and further elaborated upon in Chapters 6 (The Built Environment and Cognition), 7 (The Concept of Environmental Cognition), and 8 (The Environmental Image).

For the purpose of analysis it is necessary to separate the phenomenon of environmental cognition into its component parts - the environment, man and the mental representation, or image. However, this distinction is one that is made for pragmatic reasons only and not because it represents the components as independent and separate entities. Man and his environment are inseparable and both can be defined only in terms of the ongoing transactions in which they are mutually engaged. Man is an integral part of the physical environment and is defined in part in terms of the man-in-environment transaction in which he is engaged. The individual cannot be separated from the environment. He is part of the system he is perceiving, and the strategies he chooses become part of the environment he in turn experiences as being external to himself. All human behavior and experience necessarily take place in environments, the quality and nature of this behavior and experience is in part influenced by the environment within which it occurs. The physical environment is not something outside of and separate from human activity, it is integral to the activity. The environment is defined in terms of the mental constructions created by



The individual forms an integral part of the physical environment.

42 "Interior II" , oil, collage, metal relief on panel, by Richard Hamilton (1964).

man in his active transactional participation with that environment.

Ittelson (1973) sums it up:

Man is never concretely encountered independent of the situation through which he acts, nor is the environment ever encountered independent of the encountering individual. It is meaningless to speak of either as existing apart from the situation in which it is encountered. (p.18)

Most of the central concepts which underly the model presented here have already been touched upon in various sections of this document. The model presented here is intended to integrate and give structure to these numerous concepts as well as to the theoretical conceptions and postulates which are yet to be introduced. The model should be considered only as a general framework and not as a fully-fledged theory.

As a prelude to the detailed presentation of the model, the principle views espoused by this model will be discussed, providing a broad overview of how man comes to know and experience the built environment. Although several of the following points are related to each other, they will be dealt with independently for the sake of clarity.

Firstly, all the components indicated on the diagram - the environment, the cognizer and the image, and their subcomponents - are seen as interrelated and interdependent elements of one total system. The person as one component in that system continually influences all the other components, and he, in turn is influenced by that pattern of other components described and experienced by him as "his environment". Rudolph Arnheim (1977) describes man and architecture as one integrated system:

To Le Corbusier, man and the world he builds are an indivisible unity. Just as man is an outgrowth of nature, so the building, the furniture, the machine, the painting or statue, are outgrowths of man. The builder and his work are interdependent like the snail and its shell. Man enlarges his scope by his works, and the works receive their meaning from man's use of them. It follows from this Romantic view that man and his creation must be conceived as one integrated organism. (p.133)

Secondly, environmental cognition is depicted as a dialectical process, in which the components are in a state of perpetual change occurring over time. The dialectical process reflects the dynamic nature of the relations between man, as a cognizing being, and the built environment. (cf. Chapter 3.2.3.)

Thirdly, cognition of the physical environment rests on the twin notion of action and transaction. Man is not a passive recipient of information from the "real" environment. Piaget has shown how the individual, through active mental operations as well as active bodily contact with the physical environment spontaneously structures his experience and knowledge. Information about the environment always involves action. The environment is not passively observed; it is always defined by and experienced through activity.

In the sense that the environment defines the probabilities of occurrence of potential actions, offers differing opportunities for the control and manipulation of the environment itself, and provides symbolic meanings and cues for behavior, it can be seen as an active participant in man-environment relations. The environment provides both the "source of information on which action is based", and "the arena within which the actions do, in fact, take place" (Ittelson et al, 1974, p.107). Insofar as all parts of the man-in-environment situation enter into it as active participants, and that these components owe their very existence as encountered in a situation to such active participation, that is, their identity is affected by their interaction, the man-in-environment situation is a transactional process.

A fourth notion postulated by the model is that the environment is considered as a source of information. This is quite distinct from the traditional position in psychology where the environment, seen as the "stimulus", is taken as a source of stimulation which impinges on the senses of the person, resulting in a response which is predictable and totally determined by the stimulus.

Lastly, the model postulates a multi-dimensional response to the process of cognition. Cognitive representation, or images, incorporate informational, evaluative, affective, predictive and inferential aspects.

The Built Environment and Cognition

In being concerned with how people come to know and experience the built environment, certain fundamental questions must be answered regarding the nature of the environment, and those characteristics of environments which are important for environmental cognition. These questions presuppose an artificial division of the situation into the environment on the one side and the cognizer on the other. However, as it has been argued (Chapter 5.2), man and the physical environment together form part of one system. The environment is not something "out there" to be perceived or known. The environment and people are inextricably linked by a dynamic, transactional and systematic relationship. At any given time it is man-in-environment, rather than man and environment. However, for pragmatic reasons it is necessary to make the distinction between man and the environment; this chapter focusses attention on the environmental component, whilst the following chapter emphasizes the human component. Both components are examined against the background of the total man-environment system.

Whilst it is accepted that an empirical reality does exist independent of mind, it is contended that knowledge of this reality, in general and the environment in particular, can only be apprehended through a mental act of knowing, that is, through an active construc-

tion of thought (cf. Chapter 3.4.). This thesis is not concerned with the objective reality of the built environment but rather with man's cognitive response to that environment, with the subjectively construed environments of the mind. The first step in the analysis of these mental representations is to understand the mechanisms by which the objective reality is linked to subjective realities. What properties of the built environment per se are important in the creation of these mental images?

6.1. DEFINITION OF THE "BUILT ENVIRONMENT"

The term "environment" is defined in numerous different ways: the biologist uses the term "environment" to include a wide range of scales from the extra-nucleic matter of a given cell to the geographical or climatical conditions in which an entire species exists; to the geographer, "environment" refers to large scale physical conditions such as climate, vegetation and topography; the psychologist, anthropologist and sociologist include the political, economic, social and cultural milieu in their use of the term "environment". All these usages have one thing in common: they all refer to conditions which surround the object of interest.

Since the term "environment" can be used in so many different ways,

to avoid confusion it is necessary to define its specific use in the conceptual model presented in this study. As has already been discussed (Chapter 3.2), the human environment consists of interdependent and multilevelled dimensions. It can be differentiated into two broad categories: 1) the physical environment, which includes the man-made environment as well as the natural environment and 2) the non-physical environment which includes the socio-cultural, political and psychological dimensions of man's life. The two components comprise the "total life environment". This study emphasizes the man-made physical environment and its relationship to human experience in the context of the non-physical environment.

The man-made physical environment occurs at scales ranging from the single room to the city, and includes formally designed and "non-designed" spontaneous structures. The term "architecture" cannot be applied indiscriminantly to any man-made spatial structure; one can distinguish between architecture and mere shelter. To qualify as "architecture" a building should also contribute toward the satisfaction of human expectations, goals and self-fulfilment. Peter Cook (1967) puts it another way:

The distinction between architecture and mere shelter lies in the former's infinite ability to interpret basic (or less than basic) needs in some special way which accentuates them or conditions them so that they take on a greater relevance. At best, architecture gives experience a further dimension. (p.10)

However, for the purpose of this study, which deals conceptually with man's cognition and experience of man-made environments, the actual status of the building - as architecture or mere building - is not of particular relevance. The broader, more embracing term, "built environment" is used here to refer to the environment at the scale of buildings.

This term "built environment" is used here in a way which implies two things: 1) that there is a particular configuration of matter in space, that is, a physical system, even if there cannot be direct access to it other than through a cognitive process of construction, and 2) that this physical system is experienced. The physical system and the experience system interact in such a way so to form one dynamic system in which both are transformed over time. Man experiences the built environment, detects deficiencies and potentials and then modifies that environment. This modified environment then becomes the stimulus for a new experience and so the cycle is repeated.

The physical environment and man's experience of it is thus transformed in a continuing dialectical process over time. The physical system-experience system interaction which leads by modification to transformation is a basic process of built environment.

6.2. THE BUILT ENVIRONMENT AS A SOURCE OF INFORMATION

The pivotal point for this discussion is the notion of the built environment as a source of information. The emphasis is thus not on the specific features of the built environment - the dimensions, proportions, materials, textures, forms and elements - but rather on the general informational properties of the built environment. Information theory was developed by communication engineers to deal with the performance of communication equipment but has since become a major theoretical construct in modern science. Psychologists and environmental psychologists have also adopted this theory in cognition studies. The contemporary psychologists who first advanced an approach to perception consistent with the "stimulus as a source of information" view were Egon Brunswik (1956) and his contemporary, Adelbert Ames, Jr. (Ittelson, 1960). James J. Gibson (1968) an important and influential perceptual psychologist also based much of his research on the view that environmental perception is an information-processing system. These theories differ in their attitudes

and ideas about numerous issues of environmental cognition. However, they all agree that environmental cognition is based on an information-processing system in which the individual actively explores his surroundings and extracts and uses information in his interaction with the environment.

This approach negates the conventional view of the physical environment as a source of stimulation which impinges on a passive individual's senses. The environment does not simply stimulate the senses, but rather it offers information which is actively selected and synthesized by the cognizing individual as he acts within his total contextual situation. The environment provides messages which communicate information to a "tuned" receiver who defines these messages. Information is thus not the result of the stimulus alone, but is phenomenologically defined. The senses are regarded as aggressive, seeking mechanisms and not merely as passive receivers of sensory stimulation. Gibson (1968) disputes the classical notion of sensing as primarily receiving (with sensory receptors). He characterizes sensory activity as selective and purposive in nature:

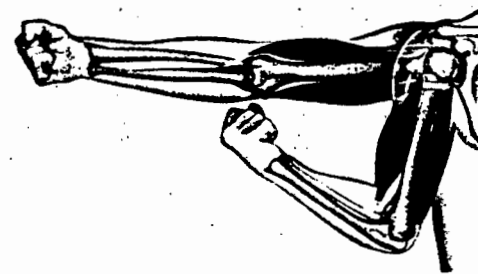
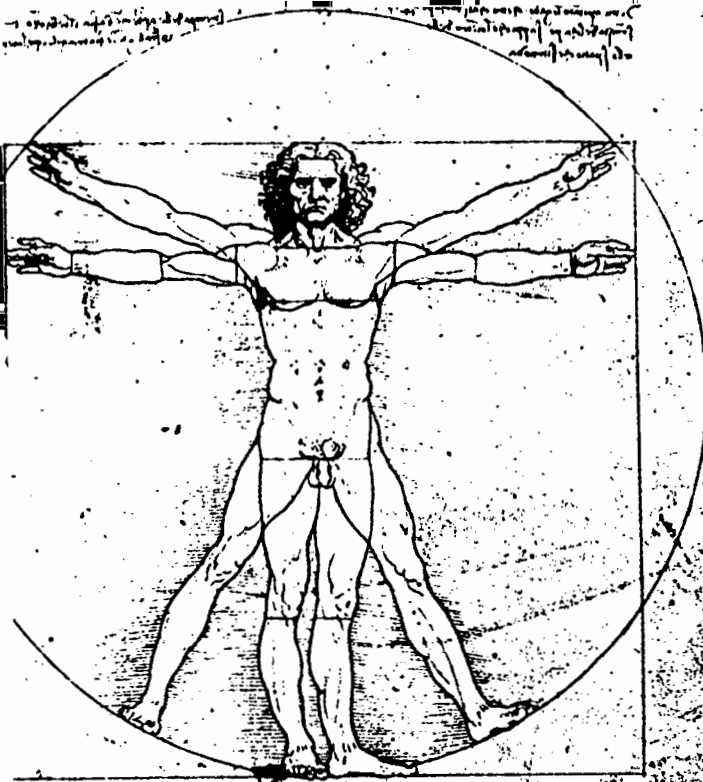
The observer who is awake and alert does not wait passively for stimuli to impinge on his receptors; he seeks them. He explores the available field of light, sound, colours, and contact, selecting what is relevant and extracting the information. (p.32)

Also, the stimulus considered as a source of stimulation, can be understood only in terms of the immediate context of physiological and physical reactions, whereas the stimulus considered as a source of information refers to a much wider context and includes information about, and from, the environment within which the individual lives and functions (Ittelson, 1973, p.9).

Several characteristics of the built environment, considered as source of information, which are relevant to environmental cognition are identified and discussed in the following sections.

6.2.1. The environment provides information through all the senses

The process of environmental knowing depends on all the senses by which the individual relates to his environment (Ittelson et al, 1974, p.106). These senses provide the means by which information is extracted from the environment; by looking, listening, sniffing, tasting and touching, the individual is able to pick up information from



43 Information is extracted from the environment through all the sensory systems: visual, auditory, taste-smell, haptic and orienting systems.

the environment. The eyes, ears, nose, mouth and skin can orient, explore and investigate. When thus active they are neither passive senses nor channels of sensory quality, but ways of paying attention to the stimulus information provided by the environment. In exploratory looking, smelling and touching the sense impressions are incidental symptoms of the exploration, and what gets isolated is information about the environment looked at, sniffed at or touched.

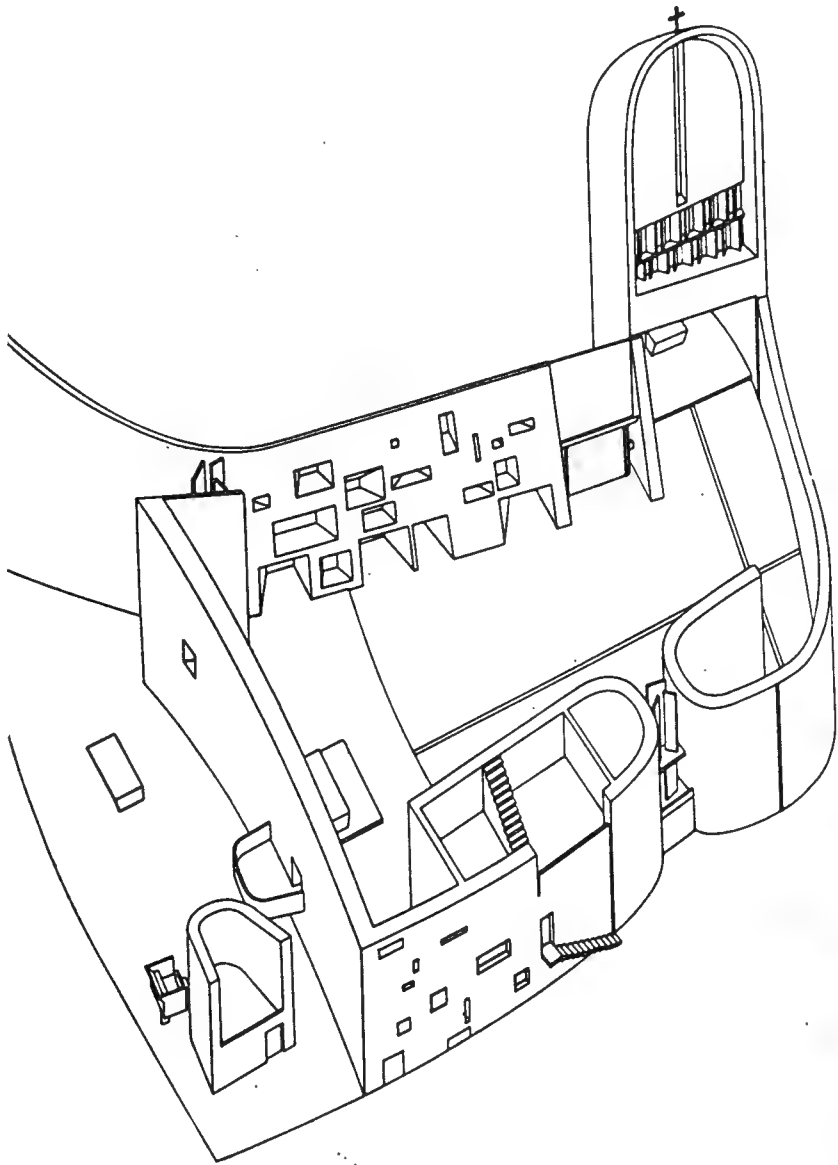
Gibson (1968) defined the senses as "active rather than passive, as systems rather than channels and as interrelated rather than mutually exclusive" (p.47). Since the senses function to pick up information, not simply to arouse sensations, this function should be denoted by a different term. Gibson uses the term "perceptual systems" to refer to the five basic senses. Rather than listing the senses according to the physiological details of the sense organs, such as Aristotle's five basic senses - sight, sound, smell, touch and taste - which are each linked to a particular physiological sense receptor, Gibson regrouped the senses around the types of information that individuals receive in their transactions with the environment. He thus focussed on the types of environmental information which the body deals with rather than on the variety of sensory receptors and responses of the body. In this he has provided

a useful framework by which we might understand some of the processes that generate environmental experience. By characterizing the senses as active detecting systems constantly seeking out information from the environment, he was able to produce a new inventory of the senses. These Gibson listed as 1) the visual system, 2) the auditory system, 3) the taste-smell system, 4) the haptic system and 5) the orienting system which is basic to all the others.

The traditionally acknowledged senses of looking, listening, smelling and tasting require little elaboration and explanation here. However, the basic orienting and haptic systems, which play a vital role in man's understanding of environmental three-dimensionality, require definition. The basic orienting system refers to the general orientation by which bodily equilibrium is attained. This system co-operates with all the other perceptual systems, since it provides a frame of reference for them by generating an awareness of what is stable and permanent in the world. The basic orienting system does not have a specific mode of attention, but according to Gibson (1968) "it might be said to have a general one - being awake, alert, and upright" (p.51).

Basic orienting refers to our postural sense of up and down which, because of its dependence on gravity, establishes our knowledge of the ground plane. A consequence of this postural orientation is the development of the sense of verticality and horizontality. We bring to our experience of buildings specific expectations of horizontal floors and vertical walls. Any gross distortion of these planes leads to feelings of unease and "loss of equilibrium". However, certain attempts have been made in architecture to deliberately deviate from the vertical and horizontal planes. Le Corbusier's chapel at Ronchamp is an example of deliberate distortion to achieve particular sensory effect; certain walls slope internally, the roof sweeps over the worshippers in a dramatic curve and the floor is slightly dished.

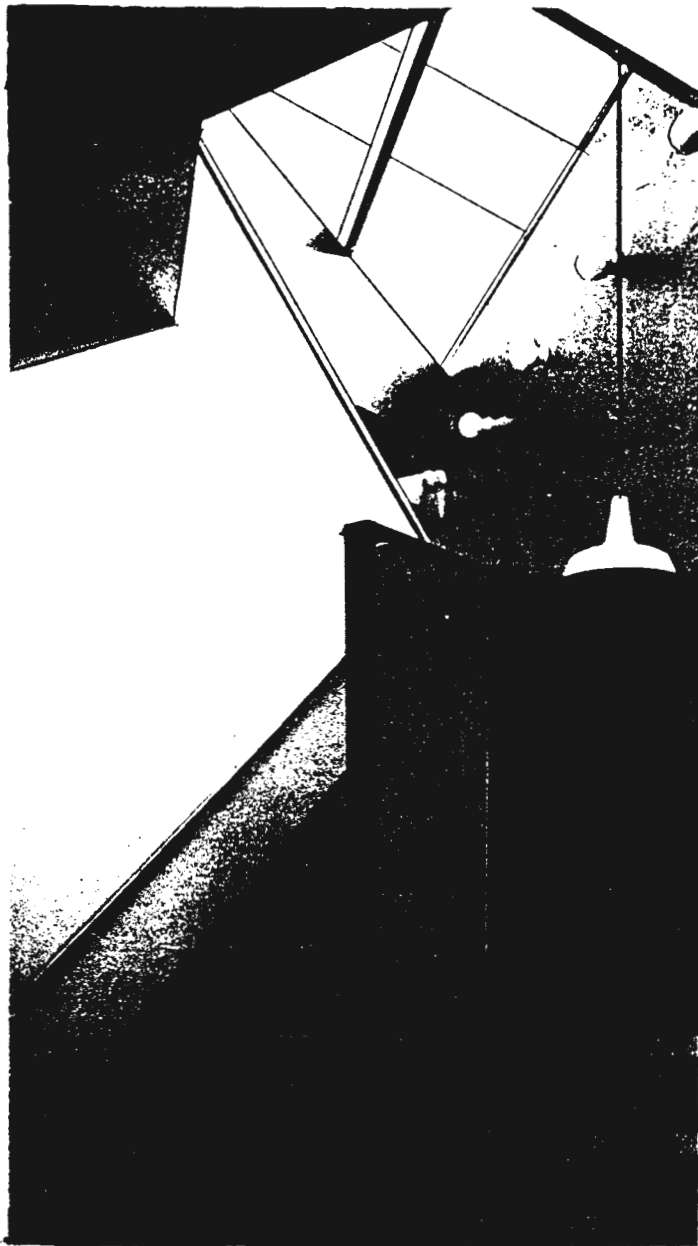
The haptic sense is the sense of touching and doing simultaneously. It involves the whole body, rather than merely the instruments of touch, such as the hands. To sense an environment haptically is to be in physical contact with that environment - to climb a flight of stairs, rather than to simply look at it. The haptic system, then, is an apparatus by which the individual gets information about both the environment and his body. "He feels an object relative to the body and the body relative to an object. It is the perceptual



- 44, (far left and above) Deliberate
45 distortion of the vertical and
horizontal planes:
Chapel at Ronchamp (Le Corbusier).
46 (left) Distinct delineation of
the vertical and horizontal
planes:
Chicago Civic Centre
(C.F. Murphy).

system by which ... men are literally [author's italics] in touch with the environment" (Gibson, 1968, p.97). The haptic system includes the sensations of warmth, cold, pressure and pain. It also includes the property of kinesthesia, which is the sense of the position and movement of one's muscles and joints and is vital to one's perception of three-dimensionality.

Certain contemporary architects have considered the haptic sense in their designs, such as the Swim Club at the Sea Ranch in California, designed by Moore, Lyndon, Turnbull and Whitaker. Here, for example, the skylit shower in the men's locker room is a few steps below the dressing bench, and the sauna and plunge pool below that, to "take advantage of one's special sense of self without clothes, and the pleasure of moving on stairs in the light" (Moore and Bloomer, 1977, p.86). However, designing with the haptic sense in mind is not a new innovation of modern times, the zig-gurats of ancient Sumeria seem to have been built around the experience of climbing. Bernini's forecourt for St. Peter's in Rome is a very sophisticated example of haptic cues being deliberately counteracted by visual cues resulting in a powerfully unsettling experience. One's sense of walking distance is confused by the receding side colonnades and by the statues which are larger near



Design for the haptic sense:

- 47 (far left) Steps in the locker room of the Sea Ranch Swim Club, California (Moore, Lyndon, Turnbull and Whitaker).
- 48 (above) Ziggurat, Ur c.2100 B.C.
- 49 (left) The forecourt of St. Peter's in Rome (Bernini).

the cathedral facade than near the main elliptical space.

Not only are all the sensory systems involved in the experience of the built environment, but for most of one's waking hours the diversity of environmental information is received through all the senses simultaneously. These five sensory systems overlap one another, they are not mutually exclusive. "In this respect", environments are multimodal [author's italics]; the senses function so to speak, in concert" (Ittelson et al, 1974, p.106). The environment is thus experienced as a unitary field. Although the environment presents itself to the individual as a series of separate stimuli - visual, auditory, touch and so on - it is the total complexity of stimulus information that constitutes the physical setting to which he responds and which influences his behavior and experience.

The visual system is, however, the dominant sensory mode and contributor to the environmental image. This is especially true of Western civilized man where the emphasis on vision is manifested in the visually oriented media of television, movies, billboards, magazines, newspapers, books and so on. The dominance of the eye may be readily indicated by simply closing one's eyes in any environmental situation, for example, in a restaurant, supermarket or one's own



50 The visual system is the dominant sensory mode and contributor to the environmental image.

"Transparency, clip-o-matic eye"
(Joe Tilson).

living room. A wealth of sensory information - sounds, temperature, smells, etc. - previously screened by the vision-dominated scene is revealed. However, at a given moment, or in specific circumstances, any other modality might dominate one's perception. The incessant whine of an electric drill may preclude one from seeing the visual variety of a particular room. A blind person experiences the built environment by processing a range of environmental information different from that of a sighted person, the dominant sensory modes of the former being touch and hearing. Not only are all the senses involved in environmental experience, but the only information that one receives directly from the built environment comes to one via these sensory systems.

The garden at Stourhead in Wiltshire, England, designed by Henry Hoare and others in the mid eighteenth century, is an example of a carefully planned, multimodal man-made environment offering a wide range of sensory experiences. This garden was consciously designed for sensory delight; the layout and landscaping is visually very appealing; varied planting offers pleasant smells; the controlled play of water, both externally and in the Grotto, offers continuous sound; Flitcroft's Pantheon containing one of the first central heating plants to be built since Roman times provides a contrasting air temperature to that outside.



51 The garden at Stourhead in
Wiltshire, England.

Even the sense of equilibrium was planned for - the timber bridge which spans one arm of the lake was deliberately designed to "give" slightly as one walked across it, (Woodbridge, 1970).

Most contemporary architects design for the visual sense and to a lesser degree, for the skin senses (heat and cold, texture) and for the control of sound. Few, however, take into consideration, and design for smell, for orientation or for the haptic sense. It is thus not surprizing that so much of contemporary architecture is lacking in experiential richness.

6.2.2. The environment provides more information that can be processed

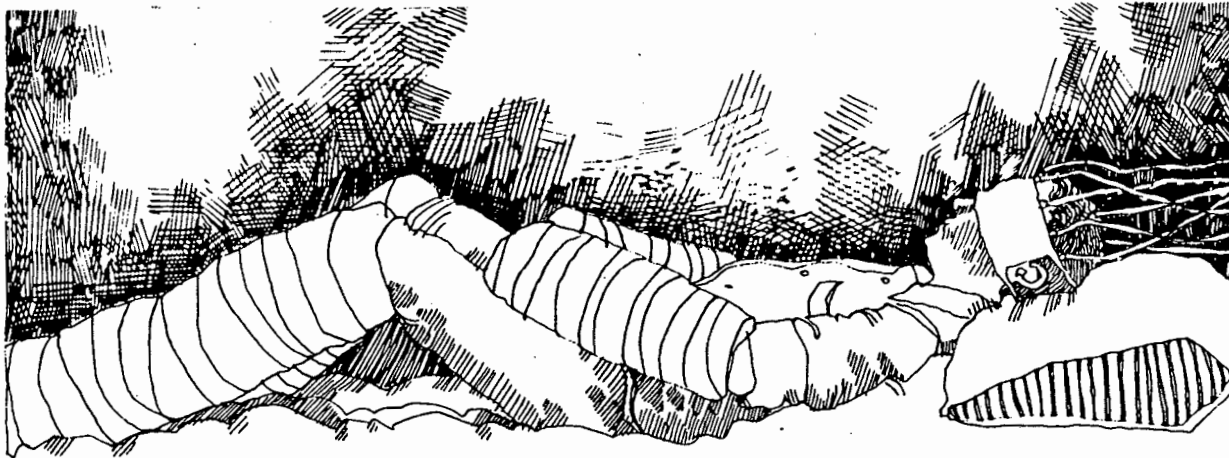
A second characteristic of the built environment is that it provides more information than can be processed by the individual (Ittelson et al, 1974, p.107). The individual is thus forced to select from the wealth of potential sensory information, his choice being dependent on his particular goals and intentions as well as the socio-cultural context within which he lives. The cognitive filter is necessary to ensure a healthy and comfortable existence; without this filter the condition of information overload would result in confusion, problems of orientation and insecurity, and mental stress.

Much information provided by the environment is peripheral to the central focus of interest. It is peripheral in the sense that one is not consciously aware of it since it is not directly relevant to the focus of attention. However, this peripheral information does play a part in environmental transactions:

Although much peripheral information may never enter awareness, its long-range effects may be measurable and important. The area behind us is no less a part of the environment than that in front. We assume it to be there, and we make predictions and act on them based on that assumption, even though we do not directly receive sensory input from it at any moment. (Ittelson et al, 1974, p.107)

At the opposite pole to sensory overload is the condition of sensory deprivation. This condition is, however, very rarely encountered in the built environment. Research in sensory deprivation (for example, Zubek, 1969) using highly contrived laboratory settings has clearly shown that people find very low levels of sensory stimulation to be extremely unpleasant after even a few hours.

Somewhere between the opposing poles of sensory overload and sensory deprivation is an optimum condition of sensory complexity. Psycho-



52 Experiments on sensory deprivation
dramatize the importance of
external stimulation.

logical research has shown that people prefer ambiguous, complex patterns in their sensory fields and that this seems to be a fundamental perceptual preference, applying even to infants and laboratory animals. (Rapoport and Kantor, 1967).

Piaget (1950) has suggested that people prefer complex visual environments over simple ones. The empirical work of Munsinger and Kessen (1964), (as cited by Rapoport and Kantor, 1967), proved their hypothesis that adults consistently prefer variability and uncertainty in their visual and auditory stimulation (although this preference ceases if pushed so far that the stimulus information becomes chaotic). The gestalt psychologist, Arnheim, who has studied the perception of art and architectural form, speaks of the "indispensable need for a minimum of complexity" (1965, p.49).

Findings in this area of research suggest that there is an optimal range of perceptual input preferred generally by subjects. This range lies between the extremes of austerity and simplicity, and chaotic complexity. Rapoport and Kantor (1967) have examined the question of complexity and ambiguity in environmental design. They have argued that,



53 (above) Complex, visually rich environment:
row of buildings in Windsor,
England.



54 (left) Simple, austere environment:
shops and offices in Rotterdam,
The Netherlands.

Since healthy behavior is exploratory, varying, venture-some in nature, it requires an environment which allows, indeed encourages, the development and exercise of such behavior ... Yet this preference for the complex and ambiguous is not limitless. Stimuli which are too simple lead to quick boredom; those which are too complex lead to confusion and avoidance. This suggests the idea that for each person there is an optimal perceptual rate. (p.214)

There has been much less awareness of these needs among designers themselves. Robert Venturi and Aldo van Eyck have, however, made a significant impact in this area of theoretical formulation. Venturi's personal credo "Complexity and Contradiction in Architecture" (1966) rejects the orthodox Modern Movement's doctrine of simplicity:

I like complexity and contradiction in architecture. I do not like the incoherence or arbitrariness of incompetent architecture nor the precious intricacies of picturesqueness or expressionism. Instead, I speak of a complex and contradictory architecture based on the richness and ambiguity of modern experience, including that experience which is inherent in art ... Blatant simplification means bland architecture. Less is a bore. (pp.22,25)

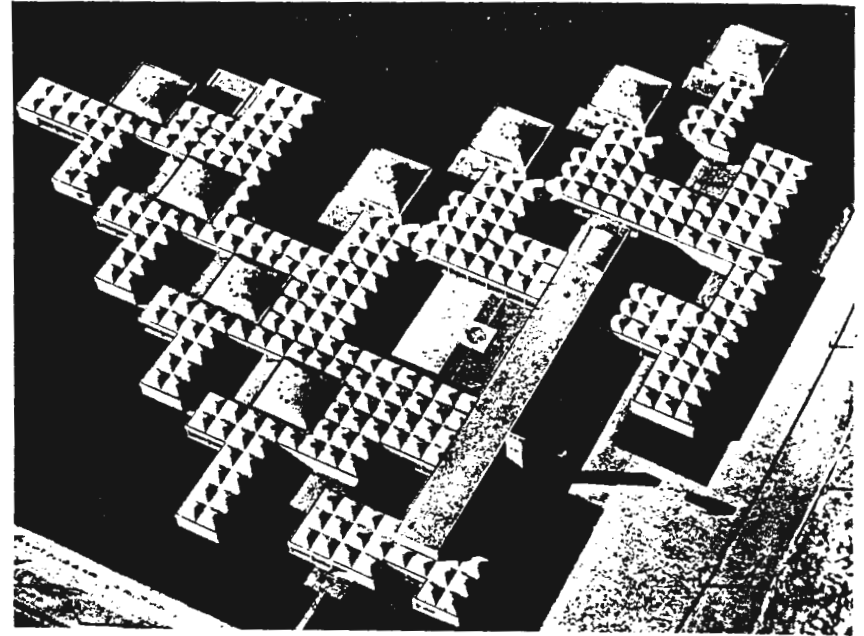
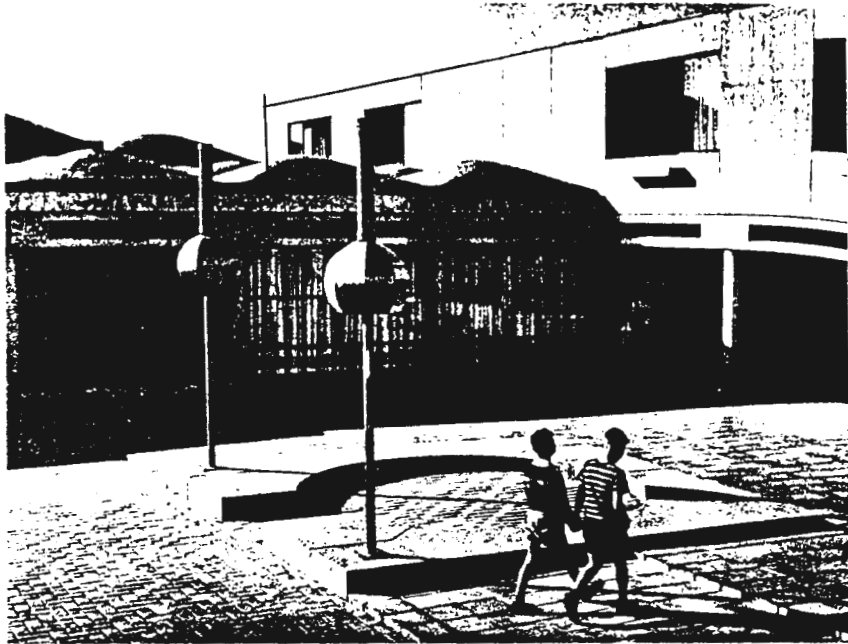
Aldo van Eyck's work and writings express his concern with ambiguity

and complexity in architecture. Van Eyck (1962) speaks of "multi-phenomena" and more specifically of "twinphenomena" rather than dual phenomena, giving examples such as: inside-outside, alone-together, many-few, open-closed. He speaks of architecture including all rather than some, and in his buildings achieved a multivalence of meaning. Regarding his Children's Home (1958) in Amsterdam, he states:

[Architecture should] break away from the contemporary concept (call it sickness) of spatial continuity and the tendency to erase every articulation between spaces, i.e. between outside and inside, between one space and another Instead the transition must be articulated by means of defined in-between places which induce simultaneous awareness of what is significant on either side. An in-between place in this sense provides the common ground where conflicting polarities can again become twinphenomena. (1962, p.602)

6.2.3 The environment is a form of non-verbal communication

The built environment has communicative properties. The transmission of meaning through the architectural medium is essential to both the use and enjoyment of architecture. Numerous elements of the built environment serve as communication symbols; the most



Aldo van Eyck: Children's Home, Amsterdam.

- 55 (above left) Entrance
- 56 (left) Semi-public space half-way in the Home
- 57 (above) Roofscape and plan.

obvious are the ubiquitous signs that direct our movements and vie for our attention but they are not the only ones. Building form and elements such as entrances, stairways, ramps and escalators, building materials, decorative elements and so on also communicate messages. Banks, for example, are often designed to convey to customers and potential customers how safe, reliable and friendly they are; likewise, shops announce their exclusivity or cheapness by their shopfronts.

The built environment provides information regarding behavioral expectations; it thus communicates cues for behavior. Particular settings suggest appropriate behavior which is socially defined. People act according to their interpretation of the environmental cues. For example, people behave differently in a church to the way they behave in a supermarket since each of these settings convey messages about appropriate behavior, and thus define to a large extent the type of activities that are likely to occur in it. Similarly, the stone curb or low wire railing alongside park paths communicates an unwritten "keep off the grass" (Cullen, 1971, p.123).

The linguistic analogy has been used in the study of how architecture communicates meaning. Although this analogy between architecture



58,59 Shops announce their exclusivity or cheapness by their facades.

and language can be traced back through the last two centuries (Guillerme, 1977), it is only in relatively recent years (about two decades), with the development of the formal discipline of linguistics, that it has been systematically applied to the question of architectural meaning and signification. Saussure's (1960) theory of semiology has formed the backbone of this area of enquiry.

Semiology, defined as the theory of signs, has been postulated as the "fundamental science of human communication" (Jencks, 1969, p.7). It is essentially a theory of how signs relate to meaning and can be applied to any system of signs, such as Morse code, street signs, architectural form and, of course, verbal language. The usefulness of applying semiology to architecture is that, in bringing up to the conscious level an understanding of how architectural meaning functions in a technical sense, it increases the area of responsible choice.

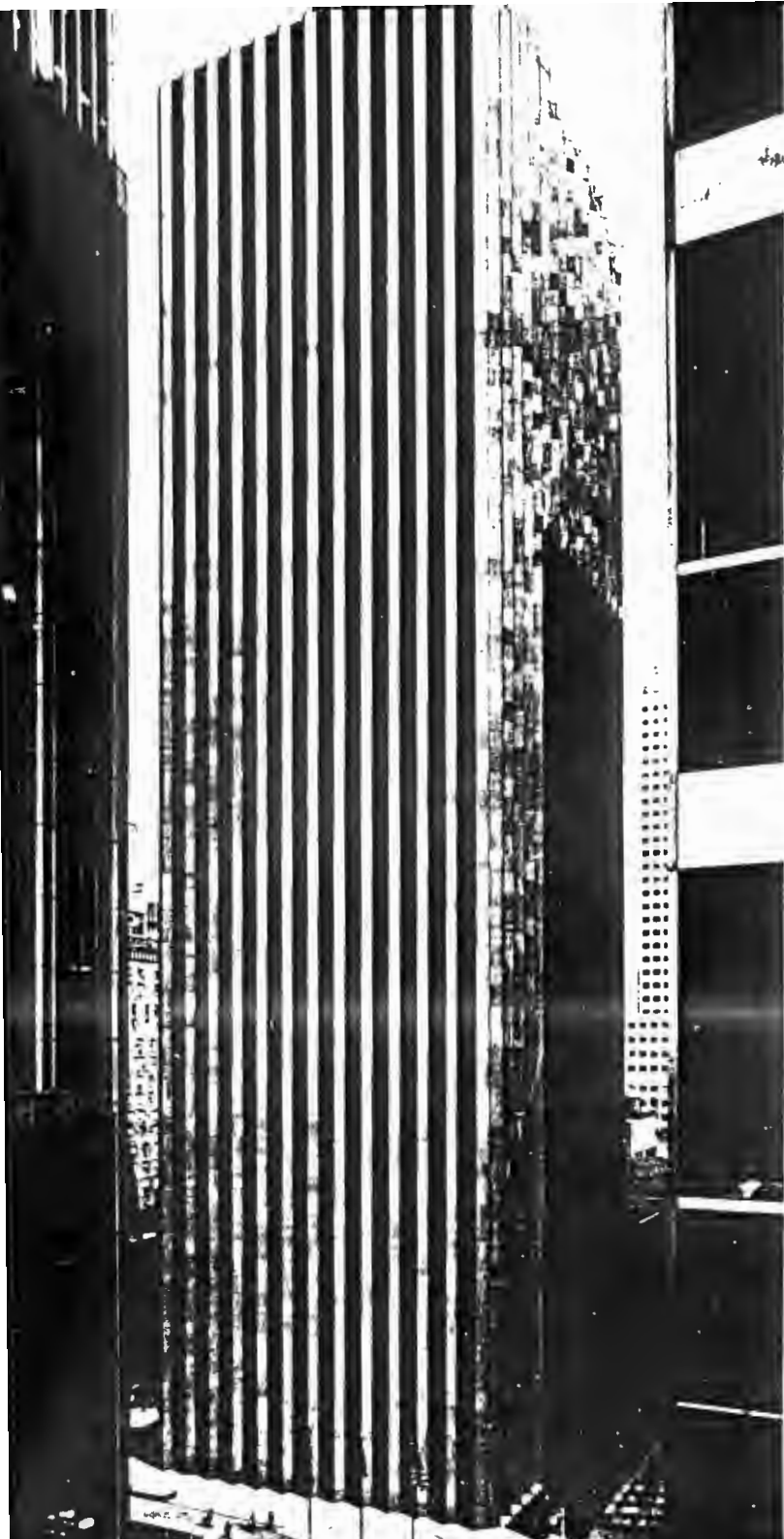
Semiology is a comprehensive theoretical scheme with its own glossary of terms and specific concerns; the details of semiology will, however, not be dealt with in this thesis.

Using the techniques of Osgood's Semantic Differential, Robert Hershberger conducted a research experiment to determine the nature of architectural meaning (Hershberger, 1970a). He concluded that the physical attributes of buildings should " be considered to constitute a 'code' capable of use to communicate an architect's 'intentions' to the users of his buildings (laymen and other architects)" (p.96). The design of buildings can thus be seen as a process of encoding information; the users, in experiencing and giving meaning to the environment, decode the information.

According to Saussure, language is a social contract, an agreement implicit between people as a whole, that each word (or sign) should have a particular meaning, and also that words (or signs) should be used in certain ways. The initial choice of sign is arbitrary but once it has been agreed on by social contract, that is, once the relationship between signifier and signified has been established in the language, it cannot be changed at will. It becomes part of that contract which is essential to the definition of all language. When we speak of "meaning" in architecture, we are concerned with "language" in Saussure's sense, as the social contract to which, at a particular point in history, a significant number of people subscribe.

If the designer's intentions are to be communicated to the users, through the architectural medium, then the "language" he uses, that is, forms, spaces, colours, etc. must be shared. It is when the designer's meanings and sign systems are not congruent with those of the users of his buildings that meaningful communication breaks down and the building is interpreted by these people as ugly, inhuman, inconvenient, alien, etc. Rapoport's critique (1967) of Saarinen's CBS Building in New York draws attention to this all too prevalent situation which arises with regard to contemporary architecture. This building was widely acclaimed by the architectural profession in contrast to the dissatisfaction expressed by the people who actually work in and use the building. Rapoport describes the building as "having the designers' meaning, the architects' meaning, the meaning of that subculture but not the inhabitants' meaning" (p.44).

The architect's problem is similar to that of the linguist who attempts to understand a language that has never before been analyzed. Design elements serve as a communication medium just as verbal language exists as a communication medium. The linguist must not interpret the language in terms of other languages he already knows; he must try to understand what the language means to the people who use



CBS Building, New York
(Eero Saarinen):

60. Acclaimed by the architectural
61 profession, condemned by the
users.

it, not what it means to him. The architect, likewise, must find out what the particular forms, colours, materials, etc. that he chooses communicates to those people who are expected to use his building. Thus regardless of the architect's talent or intentions, unless he speaks the same language as that of his audience, there can be no communication. Rather, there is confusion, misinterpretation and general dissatisfaction.

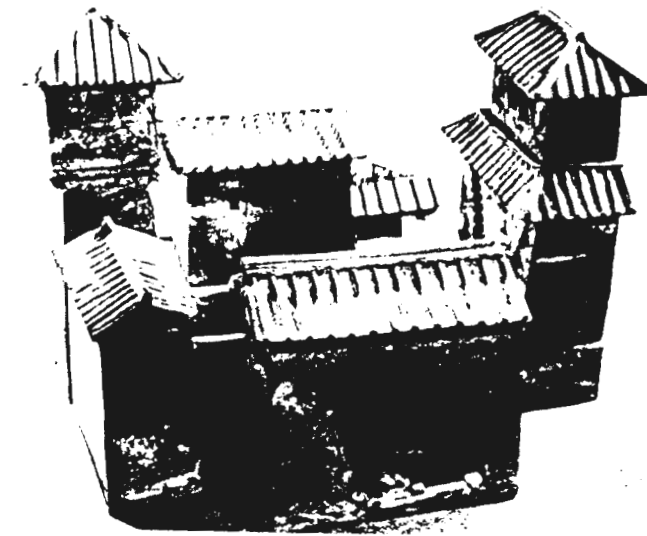
The imagery of contemporary architecture, having been developed within the profession, is relevant only to an educated minority; by and large the general public do not "understand" or relate to these new buildings. Venturi and his colleagues, Charles Moore and others have recognized the problems in this situation, where particular meanings have been developed and styles reinforced within the profession to the detriment of the public. Venturi and associates' Guild House Apartments (1960) and Moore, Lyndon, Turnbull and Whitaker's Sea Ranch Housing (1963) are a deliberate attempt at low-key "vernacular" type of design. A conscious effort has been made in these buildings (as well as numerous others) to synthesize meanings drawn from architectural history with those found in popular culture. However, in spite of these relatively new but isolated tendencies, the profession as a whole remains ignorant of the way in which archi-



62 Guild House, Friends' Housing for the Elderly, Philadelphia (Venturi and Rauch, Cope and Lippincott, Associates).



63 Sea Ranch Housing, California (Moore, Lyndon, Turnbull and Whitaker).



- 64 (left) Modern housing in Shanghai combines the Chinese domestic tradition in a simplified form.
- 65 (above) Traditional one-court house. Model made of pottery of a farmstead (1st century, A.D.) excavated in 1951 at Cheng - Chah, Honan.

tectural forms are invested with meaning by different groups of people.

Hershberger (1970a) has analyzed the options that are available for improving architectural communication: One option would be to re-orient architectural education such that it does not alter the lay perceptions that the new student brings with him. A second course would be to re-orient the training of the architect such that he is taught how forms, spaces and so on are interpreted by laymen, as well as by architects so that he can consciously manipulate these architectural elements to communicate with both groups. This implies a bilingualism where the architect has one vocabulary for addressing the public and another for communicating with his peers. (This is in keeping with Jencks' (1978) notion of "dual coding" in Post-Modern buildings.) A third possibility is to educate the public to see and appreciate architecture in the same way as architects. The first alternative is neither desirable nor possible without abandoning architectural education almost in its entirety. It seems that an approach combining the second and third alternatives might lead to improved communication between architect and building user, and hence to greater user satisfaction.

Christopher Alexander (1964), Bernard Rudofsky (1964) and others have

recognized and drawn attention to the lesson of vernacular architecture, namely: the integration and synthesis of images of the popular culture in architectural forms. "Unselfconscious" architecture evolves in response to direct feedback from the users and becomes an integral part of the culture. They have noted that the system of meanings inherent in the enduring forms of anonymous vernacular architecture is an integral part of the popular culture; the formal elements of vernacular architecture are a spontaneous expression of the common man acting under a community of experience.

The beauty of this architecture has long been dismissed as accidental, but today we should be able to recognize 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 ... Above all, it is the humaneness [author's italics] of this architecture that ought to bring forth some response in us. (Rudofsky, 1964, p.4)

There have been attempts to find those universals and absolutes in man which determine meaning (Le Corbusier's Purism is an example of this quest). Certain patterns of meaning intrinsic to man have been postulated (Osgood and Sebeok, 1965). However, it is contended here that the way man cognizes any object or environment is



66 Vernacular architecture embodies an integration and synthesis of images of the popular culture.

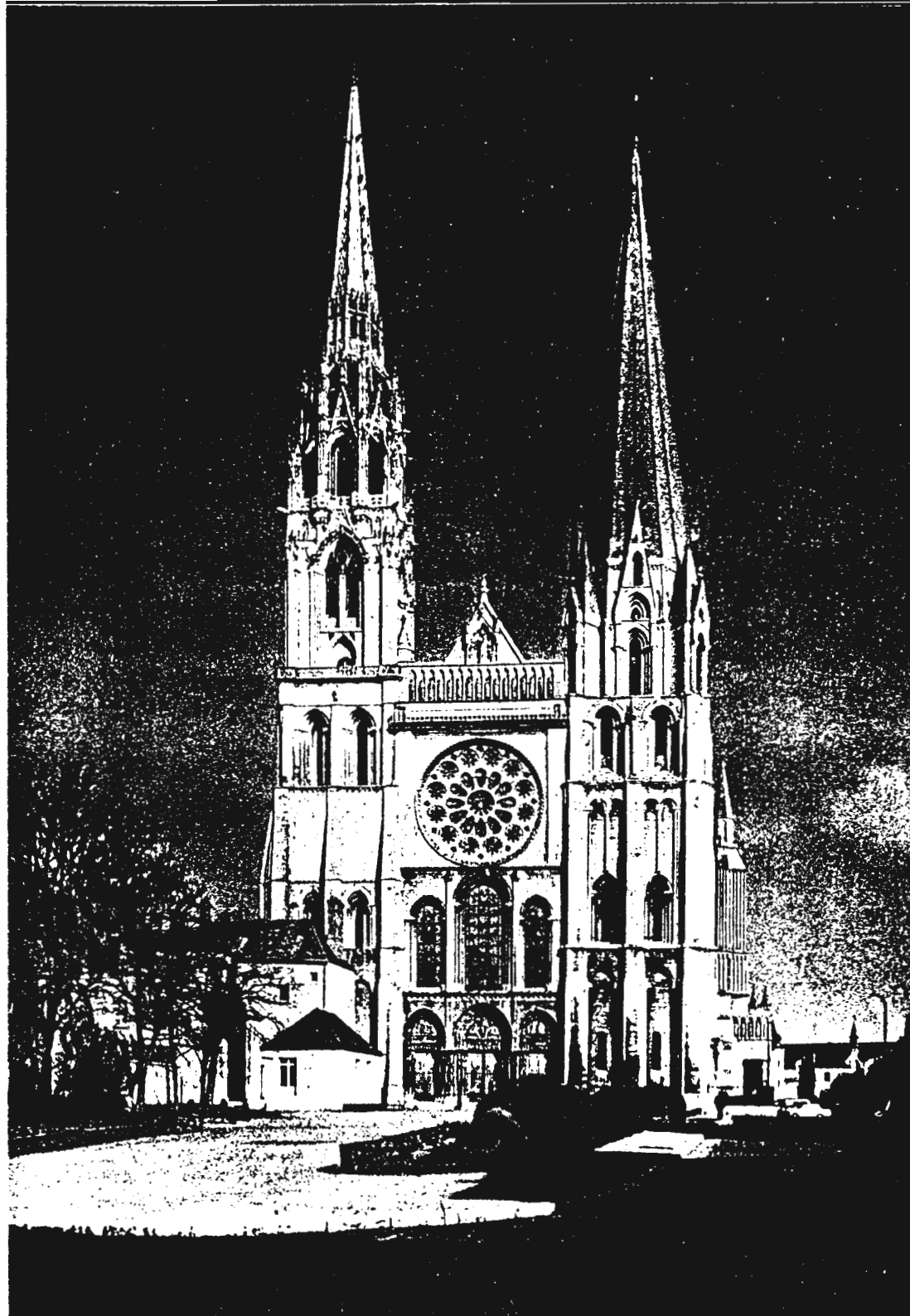
Ndebele woman in courtyard, Eastern Transvaal.

not an intrinsic part of the nervous system, but rather a function of the concepts, or schemata which he has. These in turn are the function of his total life environment.

Forms are by themselves relatively empty of meaning, unless we attribute to them some system of conventional meanings not inherent in the forms themselves. Gombrich (1963, pp.45-69) rejects the view of Modern Expressionist theory that shapes (such as those found in a Kandinsky painting) have physiognomic or expressive content which communicates itself to us directly. Attributed meanings are a function of the total environment, in particular the socio-cultural milieu, and is thus not an "absolute" or universal meaning but one that is relative to its particular context. A person from another culture, for example, an aboriginal tribesman from the South Sea Islands might have the same difficulty understanding the architecture of Western civilization as he has with our language and customs. A South Sea Islander might not "recognize" a wood panel approximately 1m wide by 2,1m high, with a knob on one side and hinges on the other as a door which one can open and pass through. Similarly he would probably not be able to distinguish a church from a post office. Rapoport (1977) has pointed out that knowledge of the environment, that is, how one encodes the messages of buildings, is largely a function of socio-cultural factors:

Everyone will see a building as being in a given place but will not understand it as a pub unless pubs are known. Similarly everyone will see a linear space (which we call street) or non-linear space (which we call plaza) but knowing for what they are used, how one behaves in them and so on are more variable.
(pp.30,31)

Architectural symbolism comes into play when a building includes elements and shapes that carry a conventional meaning that is shared by a body of people. For example, Christian churches have traditionally reflected the conventional symbolism of Christianity. The three doors in the facade and the three-sided space which are so often used in the design of churches, invoke the Trinity, twelve columns recall the twelve Apostles and so on. The architects of these buildings encode a series of institutionalized and pre-established meanings into their designs so that most parts of the building have precise referents which are interpreted accordingly by those who are initiated into the particular code of Christian symbolism. The mediaeval mind, in particular, was inclined to see such a message in every shape. Nikolaus Pevsner (1963) makes this point in discussing the Gothic Cathedral:



67 The church reflects the symbolism
of Christianity.

Chartres Cathedral, West front.

The cruciform church represented the Cross, and the weathercock on the spire the preacher who rouses the sleeping from the night of sin. The mortar, ... consists of lime, i.e. love, sand, i.e. earthly toil which love has taken upon itself, and water, uniting heavenly love and our earthly world. (p.116)

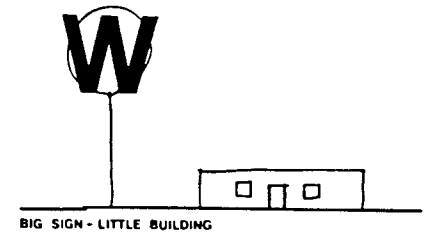
The language of architectural form is a dynamic and continuously developing language. Its vocabulary includes elements and forms which have historical associations as well as allusions to everyday experience. Gaudie (1969) defines these experiences as the awareness of space, the awareness of the flow of force (especially of gravitational force) and the awareness of rhythm (p.11). Alan Colquhoun (1971) has written of architecture as part of a "system of communications within society" (p.396) and describes the anthropological and architectural basis for the use of a typology of forms in design suggesting that not only are we:

.... not free from the forms of the past, and from the availability of these forms as typological models, but that, if we assume we are free, we have lost control over a very active sector of our imagination and of our power to communicate with others. (p.403)

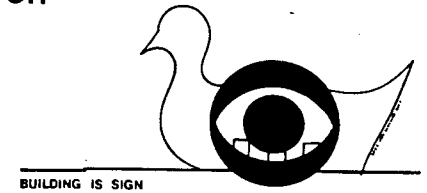
In his treatise on the communicative function of architecture (1977)

Venturi draws a distinction between the building as symbol - or "symbolic duck" architecture - and the building with applied symbols and signs - or "decorated shed" architecture. The "symbolic duck" communicates its meaning by a symbolism implicit in the undecorated physiognomy of the building. It is a building in the shape of its function (such as the bird-shaped building selling duck decoys) or a Modern building where the construction, structure and volume become the decoration. This is the form of contemporary establishment architecture which rejects ornament and instead promotes expressionism, concentrating on the expression of architectural elements themselves, that is, on the expression of structure and function. Venturi attacks Modern architectures' rejection of explicit symbolism:

By limiting itself to strident articulations of the pure architectural elements of space, structure, and program, Modern architecture's expression has become a dry expressionism, empty and boring - and in the end irresponsible. Ironically, the Modern architecture of today, while rejecting explicit symbolism and frivolous appliqué ornament, has distorted the whole building into one big ornament. In substituting "articulation" for decoration, it has become a duck.
(p.103)



OR



- 68 Big sign - little building or building as sign.
- 69 (left above) Petrol station
- 70 (left) "Long Island Duckling".

The "decorated shed" is a simple enclosure which conveys meaning by an explicit symbolism in the form of applied ornament (such as a pediment symbolising entry) or by means of signs attached to it like a billboard. Venturi argues in favour of the decorated shed, basing his polemic on the assumption that explicit symbolism is essential in architecture and that the prototype from a previous era or from the existing city is part of the source material. This point is well taken. However, Venturi's total rejection of duck architecture in favour of the decorated shed is an extremist and over-simplified position; in eliminating the whole species of duck buildings he is, in fact, reducing the modes of communication at our disposal. There is a place in contemporary architecture for both the decorated shed and the symbolic duck.

6.2.4. The probabilistic nature of environmental information

The messages that individuals receive from the environment are probabilistic rather than absolutistic, that is, the position is taken here that environmental information does not give the individual an exact and accurate picture of the environment as it really is, but rather it conveys messages about the probable nature of the environment. This view draws on the Brunswik-Ames approach to perception.

Brunswik (1956) postulated a probabilistic theory of perception to explain the relationship between the information available from the environment and the way the individual perceives that environment. It is based on the concepts of "functional and ecological cue validity". Environmental information is, in Brunswik's view, probabilistic rather than absolutistic. The individual samples the environment perceptually, then tests the accuracy of his perception through action in that environment; the perceiver thus builds up probabilities about the environment. Ames (1951) (referred to by Ittelson (1960)) also emphasized the probabilistic nature of environmental information. He, however, elaborated on this theory by developing the notion of the role of action in building up probabilities and by his emphasis on the role of the individual in creating his own probability statement.

Whilst Brunswik and Ames differ in numerous details of their theories, they both agree on the fundamental premise of the probabilistic nature of environmental information. Gibson (1968) on the other hand, whilst also viewing environmental cognition as an information-processing system, describes environmental information as absolutistic rather than probabilistic; by actively exploring the environment and extracting information from it, the individual gradually builds up a more

accurate image of the real environment. Since we have no way of gaining access to the real environment except through the cognitive processing of information received from that environment, we can never positively assess the accuracy of the information. It is thus reasonable to posit a probable relationship between environmental information and the environment as it really is.

6.3. THE PRESENT PHYSICAL CONTEXT

The present physical context refers, in the conceptual model of environmental cognition postulated in this study, to two aspects of the physical setting of a given building environment: 1) the platform from which the environment is experienced, that is, the spatial and temporal context of the perceiving person, and 2) the immediate physical surroundings of the particular environment, that is, the physical context of the perceived environment.

Two basic dimensions of the first aspect are the degree of the person's physical contact with the environment and the speed and mode of his movement. Pedestrians and motorists differ greatly in the way they perceive the city (Rapoport, 1977, p.240). Speed influences the rate and content of information processing. From within a moving vehicle environmental information is limited to



Perception of the city is influenced by the mode of movement:

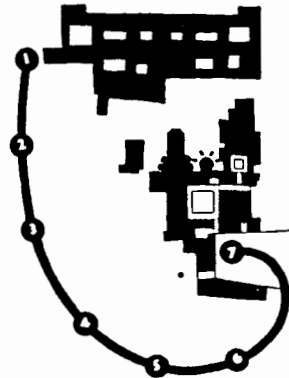
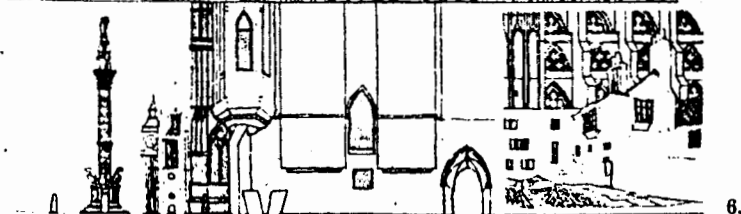
- 71 (above) Motorist's view of Main Street, Port Elizabeth
- 72 (below) Pedestrian view of the same street.

mainly the visual range, so that a motorist is cut off from a wealth of information and consequently his involvement with the environment is restricted. In comparison, a pedestrian is less insulated from multisensory information and the active nature of walking increases the dimensionality of information. At pedestrian speeds the person is free to explore the environment and can easily alter his pace and rhythm to suit the particular environment. The gradient and texture of the ground, the sounds and smells of the environment all contribute to the richer environmental experiences of the pedestrian.

The order and sequence in which the environment is experienced influences the formation of the environmental image. Cullen (1971) speaks of "serial vision" (p.9) in the experiencing of the city. This is the sequence of views which gradually reveals itself to the pedestrian and motorist in the course of travel.

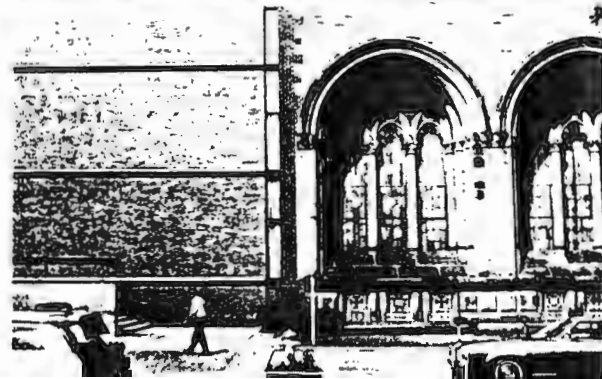
The immediate physical surroundings of a particular environment have a significant influence on the image formed (Arnheim, 1965, p.67). Contrast between juxtaposed environments heightens the impact of the particular neighbourhood, building or room perceived. For example, the impact of a bright open space will be enhanced if access to it is through a narrow and dark entry passage. Similarly, the level of

WESTMINSTER



Plan of Westminster, showing viewpoints

73 Serial vision: the shifting interplay of towers, spires and volumes as one moves through Westminster, London.



Sharp contrasts between adjacent buildings influences the image formed.

- 74 (above) Old and new in Sanaa, Yemen.
- 75 (middle) Old and new in Venice, Italy
- 76 (below) Old and new at Yale University Art Gallery (addition in 1953 by Louis Kahn).

illumination and the temperature and climatic conditions which prevail in a given environment have a profound influence on the communication of environmental information.

This chapter has presented certain notions regarding the informational nature of the built environment. Several characteristics of environments which are relevant to environmental cognition have been identified and discussed and serve as a point of departure for the analysis of environmental cognition which is presented in the following chapter.

The Concept of Environmental Cognition

The question of how people know or conceive of the built environment, how they give meaning to it, and how they structure the environment in their minds is answered by defining the concept "environmental cognition". This implies the definition of, firstly, the nature of the mental processes involved in acquiring knowledge of the environment and, secondly, the nature of the resulting cognitions formed. This chapter focusses on the former, that is, the cognitive process, whilst the product of this process, that is, the environmental image, forms the focus of the following chapter. It is important to note, however, that these two aspects of cognition - process and product - are in fact interdependent and the separation into two distinct chapters is made only for purposes of analysis and not because it represents independent and separate entities. A certain degree of overlap in the two chapters is therefore inevitable.

This chapter presents some basic notions concerning the function and mechanism of environmental cognition and those factors which play an important role in determining the product of the cognitive processes. The essence of the view espoused by the model presented in this thesis is that environmental cognition is an information-processing system involving the active selection of environmental information and the mental processing of that information which leads to the construction

of the environmental image. The actual choice of information and the nature of the resultant image are a function of a dynamic interaction between what the individual brings to the situation (that is, inner organismic factors, including physiological, psychological, social and cultural systems) and the demands made on him by the situation (that is, external sociophysical environmental factors), as well as the feedback from previous cognitive experience.

7.1. DEFINITION

The word "cognition" has its roots in the Latin "cognitionis" (f); according to Cassell's Compact Latin Dictionary, this is translated as "getting to know, knowledge, acquaintance," and in the plural, "ideas, conceptions". The Latin thus refers to both the process of knowing and the product of knowing.

The cognitive approach to understanding man-environment relations views cognition as the structure underlying the active interdependence between man and the environment. Scheerer (1954) states that general cognitive theory deals with:

the problem of how man gains information and understanding of the world about him, and how he acts in and upon his environment on the basis of such cognitions. (p.91)

A cognition can be identified as a "centrally mediated process of representing external and internal events" (p.137). In less technical terms, cognitions are beliefs, thoughts or items of information which an individual possesses concerning his own internal condition and the nature of the social and physical environment in which he exists. An approach which focuses on cognitive activity thus stresses the role which these types of conceptual organizations play as mediators between environmental stimuli and human response in the course of man's transactions with the environment. Cognitions are viewed as mediating variables in that, though they may not be directly observed, their functioning is presumed to intervene between stimulus, and response, and to be involved in an important way in determining the meaning which the stimulus has for the individual; it is in terms of this meaning that a response is initiated.

Moore and Golledge (1976) broadly define environmental cognition as:

the awareness, images, information, impressions, and beliefs that individuals and groups have about the elemental, structural, functional and symbolic aspects of real and imagined physical, social, cultural, economic and political environments. (p.5)

The above definitions deal with cognition in general and its function in the total environment (physical and non-physical environments); however this thesis focusses on a subsection of cognition, that is, with cognition of the physical environment, and of the built environment in particular.

In the previous chapter the physical environment was defined as a source of information. This view of environment almost demands that one treat environmental cognition as an information-processing system. This approach is in contrast to the more conventional sensation-based theories of cognition where the stimulus is defined as a source of stimulation, rather than as a source of information. Environmental stimuli are said to arouse the senses, and the sensations so aroused are integrated in some way into a perception. Sensation-based theories attempt to deal with the supposed units of perception - sense data - and to explain how these are put together in the brain. Efforts were made to identify and categorize the fundamental sensations and the various sensory apparatus throughout the body, and to discover the laws by which these body organs and sensations were related. However, it appears that by the 1930's the method of investigating the senses by categorizing the many sensations and their receptor elements had become frustrating, excessively

complex, and more useful to physiologists than psychologists. The way was set for new strategies for systematizing the senses psychologically.

Information-based theory of cognition focusses, not on describing how sensations are organized to comprehend the environment but on the discovery of how we process phenomenal information. The existence of sensory experience is not denied but is viewed within a different framework (cf. Chapter 6.2.1.). The defining qualities of particular sensations do not provide the basis of cognition, but rather, as in the case of visual perception, the optic array, or ambient light, provides potential information for the observer. It only becomes effective if the observer attends to it.

Cognition refers to the psychological processes whereby people select, organize, store and use information. Cognitive processes are thus involved in perceiving, remembering, day-dreaming, contemplating, problem solving, deciding, evaluating, planning, imagining, as well as numerous other mental activities (Leff, 1978, p.81). The details of exactly what processes operate and how they interrelate are still partially conjectural and will not be dealt with in this study.

7.2. FUNCTION OF ENVIRONMENTAL COGNITION

Environmental cognition has a fundamental function in man-environment relations. It is the source of all environmental experience. Our awareness of the phenomenal world is given through cognition.

7.2.1. Mediating role

The transactional-constructivist theory of knowledge has been introduced in Chapter 3.4. The basic position is advanced that knowledge of the world is constructed by man in the context of a series of on-going transactions between man and the environment. Knowledge is not given "a priori" before experience, nor is it acquired through pure reason independent of experience; it is also not gained directly through sensory experience. Knowledge is the product of an active and intentional mental construction. In adopting a constructivist position, it is held that there is no way to apprehend the nature of what we take to be "the environment", except through the minds of people, that is, through man's cognitive processes. Environmental knowledge is thus mediated by cognition. Neisser (1967) has noted that:

we have no direct, immediate [author's italics] access to the world, not to any of its properties ... Whatever we know about reality has been mediated [author's italics]. (p.3)

The cognized environment, or environmental image, does not constitute a direct copy or exact representation of the objective properties of the real environment; rather, the known environment is a personal and socially influenced construction of the mind. It is thus a product, not a cause of cognition.

Whilst it is recognized that sensory experience does influence to a considerable degree the acquiring of environmental knowledge, it is contended that environmental knowledge does not arise directly out of raw experience. Sensory experience is mediated by cognitive structures and operations. A central assertion regarding environmental cognition is that seeing, hearing, etc., are all acts of construction using, to a greater or lesser extent (depending on circumstances), the stimulus information from the environment as the raw material.

The way in which environmental information is mediated by the individual's cognitive processes is of great importance since the resulting cognitions, or images determine to a great extent the way in which he will respond to that environment, that is, his emotional, intellectual and behavioral response. Cognition is in this sense intimately related to experience. In the words of Leff (1978):

The ways in which we process information are central considerations in the content and the emotional tone of our experience, the style and effectiveness of our adaptation to the environment, and the potential enhancement of each of these domains. (p.81)

7.2.2. Ordering of environmental information

The functional relevance of environmental cognition centres around the ordering capacity of this information-processing system. In selecting, categorizing and organizing information, environmental cognition orients the individual to his surroundings, giving coherence to his world. Ittelson et al (1974) describe the ordering role of environmental cognition:

It provides us with information about the systematic relationships among the components of our world, and it is the means whereby we can relate our own goal strivings to the environment within which we live. [Environmental cognition] thus orders our world, with ourselves as part of the ordering process. (p.123)

The physical environment provides an inexhaustible reservoir of information. Unless information is selected, sorted and organized by the individual, the environment would be a formidable phenomenon to contend with. The ordering of the environment is essentially

a taxonomic process, whereby the environment is made meaningful by classifying, naming and discriminating according to some culturally and socially recognized conceptual system. Different social and cultural groups classify the world differently by the use of different taxonomies. The cognitive process is a mode of reducing, organizing and ordering the enormous load of information provided by an intrinsically chaotic environment. It imposes a structure on the environment, thereby transforming the world psychologically into a predictable and manageable environment within which to live. Ittelson et al (1974) maintain that

It is this cognitive structuring of the environment that enables us to organize our world in a recognizable and manageable way. Unless we were able to schematize the environment in terms of mental images, we could hardly hope to live in it with any degree of predictability, although it is quite obvious that we are continually having to correct our distortions against reality. (p.14)

People have a basic need for order and meaning in their lives. Without some measure of perceived environmental order and stability, the individual, finding himself in a chaotic and totally unpredictable world, would experience considerable confusion and mental stress,

and would be unable to carry out his daily activities and to pursue his particular goals and purposes. Environmental cognition thus contributes towards the satisfaction of a basic human need; in this sense it is essential not only for the comfort and pleasure of everyday life but is also necessary for man's very survival.

The individual's only known world is that which he has mentally construed in the process of cognition. The isomorphic relationship between the individual's cognitive representation and the real world is something which can never be accurately assessed. The effectiveness of his cognitions is measured, not by comparing them with an existentially independent and "objective" environment, but rather by their usefulness in aiding him to achieve those goals for which he is striving.

The need to experience the environment as a pattern of meaningful relationships is something primary and spontaneous, not something acquired by training. "Man's search for meaning is a primary force in his life" (Frankl, 1964, p.99). Meaning, however, does not have an independent existence; rather, meaning resides in the minds of people. These mentally construed conceptions are then projected onto the world. This inherent tendency to endow forms with meaning is exemplified in numerous ways; to the child's mind, the "Man in the Moon", or the moon



People have a tendency to endow forms with meaning:

- 77 (far left) The "Man in the Moon"
- 78 (far left above) Inkblots resembling those used by Rorschach
- 79 (left) Faces, animals, etc. seen in cloud formations.

as a large round of cheese gives a more tangible meaning to the pure form of the moon; in psychology, the Rorschach test is used to analyze the particular meanings given by a subject to an ink blot, and hence to uncover those realms of the mind with which the subject is concerned; Leonardo da Vinci, in his notebooks, refers to the meanings placed on the arbitrary formations of clouds; the simplistic cylindrical forms of the University of Cape Town's newest residences are referred to as the "Tampax Towers", and so on.

However, whilst this "effort after meaning" is seen as a primary and common force acting in every individual, the content of the meaning is variable and depends on numerous contextual conditions, such as social, cultural and personality factors. Those factors which influence the processes whereby environmental information is made meaningful are discussed in Chapter 7.4.

7.2.3. Predictive Role

Environmental cognition is not simply a static process whereby the present environmental reality is made known. An important and far-reaching function of cognition is the predictive role which it plays in man's relationship to the physical environment. Environmental cognition is a forward-looking process which enables the individual

to predict the consequences of his actions in the environment.

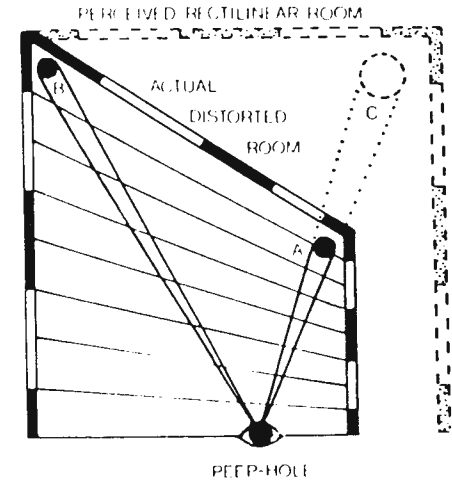
The processes of environmental cognition include selection, relating and the development of mental representations of the environment built up from a hypothesis-forming and testing attitude to the environment (Ittelson et al, 1974). Cognition aims at valid assumptions about the nature of the environment. In order to operate effectively in the world and to attain one's particular goals, the individual interacts with his surroundings, making suppositions about the nature of the environment and predicting the consequences of his actions in that environment. Predictions, however, are not always accurate. They are tested by the individual's actions in the environment and are modified where necessary so as to become more accurate and effective. In this way a pattern of predictable relationships is gradually built up through the interplay of cognition and action in different environmental situations.

The individual learns to recognize the relevant relationships in the environment that correspond to similar relationships encountered in other environments. Experience with previous situations of a similar nature gives him a clue as to what will probably occur in the present situation. He can thus infer that, for example, an escalator will

transport him from one level to another; an object thrown in his direction will strike him if he does not move out of its way; he is likely to slip and fall if he runs carelessly on a slippery floor surface, and so on. However it is not always as straightforward as these examples might suggest; perceptual distortions and illusions, such as in the assessment of distance, height, etc. lead to predictions and expectations not being realized. As Ittelson et al (1974, p.123) have pointed out " 'appearances are deceiving' and perception is seldom if ever absolutely accurate. In the face of this we are continually striving to reduce the probability of distortion to acceptable limits."

Environmental cognition enables the individual to reconcile the environment he experiences anew each day with the environments he has already experienced and come to know. "By referring what we perceive to what we assume on the basis of past perception, we are able to create and maintain a stable environment" (Ittelson et al, 1974, p.124).

Having examined the more important functions of environmental cognition, the discourse now turns to the identification and discussion of the mechanisms of environmental cognition. The following section



80,
81,
82

The Ames Room is deliberately designed (as the diagram shows) to produce distortions of size perception.



What the eye can see and what
the mind will believe can be
2 different things.

83 "Belvedere", lithograph by M.C.
Escher.

presents some basic notions concerning the processes by which environmental information is cognized.

7.3. THE MECHANISM OF ENVIRONMENTAL COGNITION

As has been noted in the previous section of this chapter (7.2.2.), people are engaged in a search for a valid and useful understanding of the world in which they exist. The task for the infant is to create for himself a reasonably ordered and stable world out of the kaleidoscopic and chaotic morass of environmental information. This task continues into adulthood and its realization is a necessary condition for a sane and fulfilling human existence. Cognition is a process of imposing an order on the environment, so that the consequences of behavior in a particular environmental situation can be predicted with some measure of accuracy. This ordering involves the process of abstracting and creating concepts and schemata out of which environmental images arise. Knowledge is neither innate, nor is it a direct copy of reality, but rather to grasp reality it is necessary for the individual to create the structures which enable him to assimilate reality.

7.3.1. Schemata

In broad outline, the basic position held here regarding the development of environmental knowledge is that people as they grow up develop a system of relatively abstract and generalizable conceptual structures which reflect certain perceived regularities in the relationships among environmental phenomena. In order to organize the influx of environmental information the individual develops generalized concepts, or classes of environments, objects and events, so that new information can be fitted into an existing scheme of experience. These mental structures, or "schemata", then determine the way the environment is perceived. For example, in processing visual material, schemata are used for identifying regularities, grouping similar or contiguous events, or emphasizing separation, continuity, closure or symmetry, and so on. They provide the basic framework whereby environmental information is selected, categorized and stored so that it can be easily retrieved as the situation arises. New information is related to the stored information of past experience through the way it fits into the individual's schemata.

This is in accordance with Piaget's developmental theory (1950) which provides an insight into the processes by which the individual

forms his picture of the world; Piaget shows how the individual's consciousness of his surrounding environment develops and how he gives meaning and order to the environment through the acquisition of "schemata". These schemata - which have been defined as the cognitive structures by which individuals intellectually adapt to and organize their environment (cf. Chapter 3.2.5), and which may be viewed as "categories of knowledge into which information is classified" (Pikunas, 1976, p.18) - are formed during mental development through a complex transaction between the individual and his environment and by this process a man's actions, or "operations" are grouped into coherent wholes. According to Piaget, the individual, rather than submitting passively to the environment, modifies it by imposing on it a certain structure of his own.

Piaget (1954) has shown many examples of how cognitive structures, or schemata influence the development of environmental knowing. He has shown how the child's current cognitive structure dictates what information can be assimilated and what will be ignored. There seems to be ample evidence that in the process of coming to know an environment, the person accumulates new information, tries to structure it and changes his current schemata in the light of this new information. Piaget refers to this as the "assimilation" of new

"aliment" or new "food for thought" to some pre-existing structure, and the "accommodation" of this rudimentary structure to further experience and information. Assimilation is the modification of input information, by the activity of a pre-existent structure; accommodation is the active modification of the structure, or schemata, itself, so as to adapt to the input. In the same way that assimilation and accommodation are complementary and inseparable processes, so the gathering of information and the structuring of it are simultaneous and cannot be separated.

What is known about the environment is not just a function of what information is available but also a matter of the inherent ways in which the mind of the particular individual structures the available information. Piaget's theory is thus rooted in the constructivist hypothesis: reality is construed by the individual in the course of his environmental transactions. The way he construes the "reality" of the external world, in particular the built environment, is determined by the schemata which he holds. An example of how mental constructs influence perception is found in Tom Stoppard's play, "Jumpers" (1972):

Meeting a friend in a corridor, Wittgenstein said: "Tell me, why do people always say it was natural for men to assume that the sun went round the earth, rather than that the earth was rotating?" His friend said, "Well, obviously, because it just looks as if the sun is going round the earth." To which the philosopher replied, "Well, what would it have looked like if it had looked as if the earth was rotating?" (p.75)

Schemata can thus be viewed as the intervening variable between environmental information and the individual's cognitive response, that is, the resultant environmental image which is construed. The processes of knowing and giving meaning to the physical environment are far more complex than simply learning an appropriate response to particular stimuli. Piaget's theory demonstrates that any stimulus from the external world is filtered through a mental structure of schemata, which influences the way the environment is conceptualized by the individual.

Charles Jencks (1969) in his analysis of meaning in architecture postulates an "extrinsic theory of meaning" (p.17). His basic contention is that the concepts or schemata that we have determine perception and that instead of these schemata being an intrinsic part of the nervous system, "they are slowly created through language and other cultural sign systems ... We form schemata by constant bombardment from outside

stimuli, but also by relatively pure thought (logic ...) and language" (p.18). Schemata are thus not seen as an "a priori" and intrinsic part of the human mind, rather, the propensity for the human mind to acquire these schemata may be seen as inborn and intrinsic. (Jenck's analysis of the forces which contribute to the development of schemata is extended in this study to include social norms and values, psychological characteristics and physiological capacities).

Schemata evolve gradually through the individual's transactions with his environment. According to Piaget and Inhelder (1956):

it is quite obvious that the perception of space involves a gradual construction and certainly does not exist ready-made at the outset of mental development. (p.6)

It thus appears that information-processing is a learned ability. New information is matched against existing schemata, which are themselves gradually being modified through the dual functions of assimilation and accommodation; learning occurs in the development of both cognitive structures and processes. All environmental learning tasks are not solved in early childhood, but a framework is established for the future learning of physical environments. Piaget's developmental theory is thus diametrically opposed to those theories of learning

where the acquisition of knowledge is seen as the quantitative accretion of information and facts; Piaget is concerned with the qualitative changes which take place as the child develops cognitive structures, thereby creating an increasingly complex framework for processing and understanding environmental information.

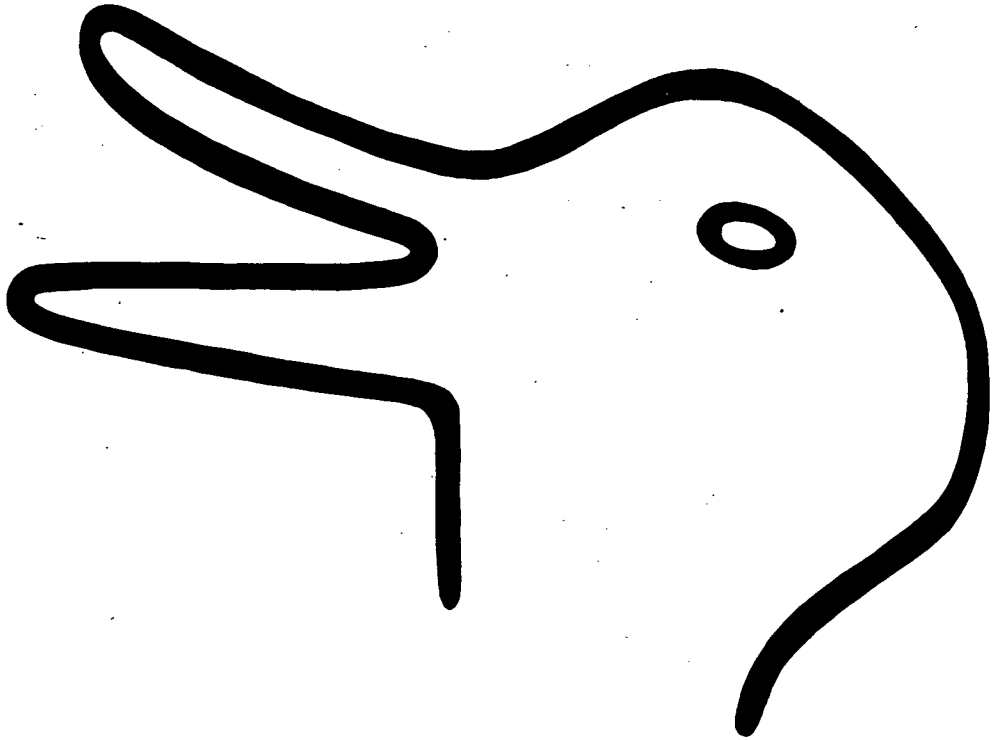
The term "schema" was probably first used by the British neurologist, Sir Henry Head (1920, p. 605) in his work dealing with the "phantom limb" phenomenon where a limb seems to be present to its owner long after it has been amputated. He used the term to describe the neural patterns that must be progressively built in the cortex to tell the person where his limbs are. Sir Frederic Bartlett (1932) broadened and elaborated the concept of the schema, particularly to explain the phenomenon of memory. Numerous other psychologists, including Allport (1947), Hebb (1966) and of course Piaget (1950, 1954) have employed the notion of schemata in one context or another. However this concept is by no means limited to psychology ; it provides a useful framework by which numerous man-environment phenomena can be explained, and has found application in numerous disciplines, although the actual term "schemata" might not always be used. The common thread linking the variety of usages is reference to some sort of internal integrative process which plays an important part in the determination of cognitive response.

Edward Hall (1959), the anthropologist, has noted that

there is a growing accumulation of evidence to indicate that man has no direct contact with experience per se but that there is an intervening set of patterns which channel his senses and thoughts, causing him to react one way when someone else with different underlying patterns will react as his experience dictates. (p. 145)

The art historian, Gombrich (1962), outlines in his book, "Art and Illusion", how cognition is influenced by the schemata which the individual has. He uses the duck-rabbit figure (p. 4) to exemplify this phenomenon: depending on the schemata of the viewer, the figure is seen as either a duck, or a rabbit, or both but at separate moments in time. It is in fact, very difficult to see this figure as both rabbit and duck simultaneously or as an abstract form which is neither duck nor rabbit, as the mental constructs of the individual tend to impose order and to imbue the form with meaning.

Various investigations have revealed that the formation of cognitive schemata has a neurophysical basis (Stea, 1974, p. 163). There is evidence to suggest that the 2 hemispheres of the brain have different cognitive functions - the left handling fragmented, non-dimensional, verbal, rational, analytical thought, while the right sides copes with



84 Is it a duck, or is it a rabbit?

dimensional spatial thought. This issue will, however, not be further dealt with in this work.

Much of the literature dealing with cognitive processes and the notion of schemata fails to distinguish between "schema" and "image". The two concepts are often confused and used interchangeably whereas they in fact represent two distinct, although interdependent entities. In essence, the term "schema" is used in this thesis to refer to the abstract mental structure by which environmental information is processed in the course of cognition; image, on the other hand, is used to refer to the product of environmental cognition, that is, to the construed mental representation of the environment (cf. Chapter 8.2 for a more detailed definition of "the image".)

7.3.2. The role of action in cognition

Essential to Piaget's theory is the notion of the active organism (Piaget, 1963). His findings strongly contradict the assumption of behavioristic "learning" theories that the child is a passive recipient of stimuli from a "real" environment. On the contrary, his findings indicate that, in adapting to his environment, the individual actively initiates contacts and structures his experience. Thus according to Piaget's model, at the core of human development is the

concept of the individual in an active relationship with the environment; the action of the individual in the environment, as he moves about in it, produces increasingly complex functional knowledge by creating new schemata. It is through his active participation in the environment that he comes to know and experience that environment.

Cognition may be viewed as a reaching out to the world. Man does not passively receive environmental stimuli but actively explores and searches for relevant environmental information in an attempt to satisfy his basic need for order and meaning in the external world, as well as his need to achieve particular goals and purposes. "This search for information is a characteristic feature of our relation to [the] external world" (Ittelson et al, 1974, p. 123).

J. Gibson (1968) and other perceptual theorists have shown that man is very active in obtaining information from the environment. Body, head and eye movements, for example, all play key roles in the exploration and selection of environmental information. Sense organs, when not actively used, are minimally operative. To detect differences in the texture or hardness of surfaces, it is not sufficient to simply place a finger on

them; the finger must be moved across the surfaces. "It is possible to have eyes and not see, ears and not hear" (Tuan, 1974, p. 12). The fundamental tenet is that environmental experience, is a continuing product of an active endeavour by an individual to create for himself a situation within which he can optimally function and achieve his own particular pattern of satisfaction. Environmental cognition is thus purposive and goal-directed.

The individual's cognition of and action in a particular built environment are inextricably related processes. "How we behave in a setting is a function of how we perceive it, but these perceptions in turn are dependent on the information we derive from our actions in this setting" (Ittelson et al, 1974, p.113). The individual thus engages in an active dialectic with his physical environment.

Man has a dual function in the physical environment; man the responder to the environment on the one hand, and man the actor on the environment on the other hand. Man as responder to the environment has traditionally been considered the subject matter of the social sciences, who have shown very little interest in man as the manipulator and builder of environments. However, as Ittelson et al (1976) point out,

The way man responds to his environment affects the way he acts on it, the way he acts on it affects the way he responds. Out of this continuing process emerges a picture of man as the active creator, psychologically and physically, of the environment within which he functions.
(p. 191)

Environmental cognition involves an active process of transformation. Cognition is an intellectual function which enables the individual to transform the chaotic outer world apprehended by his senses into a coherent inner world that he can manage. In getting to know an environment certain aspects of one's experience, beliefs and attitudes are attributed to that environment. In this sense the environment is transformed in the act of getting to know it. This notion of transformation is one of the key concepts in Piaget's theories. He contends that it is only by way of active transformation that knowledge is possible:

In order to know objects, the subject must act upon them, and therefore transform them....
From the most elementary sensorimotor actions.....
to the most sophisticated intellectual operations,
which are interiorized actions, carried out mentally...
knowledge is constantly linked with actions or
operations, that is with transformations
[authors italics]. (Piaget, 1970, p.704).

system, the physical and non-physical components of which are mutually interdependent. (cf. Chapter 3.2.2). The person as one component in the total systems acts on the other components, and is in turn influenced by them. Environmental cognition never occurs in isolation; it always occurs within a particular contextual situation. Ittelson et al (1974) articulate this holistic approach to environmental cognition:

[environmental cognition]never takes place"by itself".
It can be studied only as part of the situation in which it occurs, and the components into which that situation can be analyzed are determined by the situation in which they are encountered. (p. 104)

The selection of, and response to environmental stimulus information is conceptualized in the proposed model as a function of the individual's total life environment; that is, the way in which the individual gets to know the physical environment and imbues it with meaning is determined by his physiological characteristics, his psychological make-up, his previous cognitive experience, the socio-cultural system within which he operates, his current state, as well as the nature of that physical environment, and the inter-relations between all these variables. The model thus embraces the Parsonian systems approach (cf. Chapter 2.3) with its interdependent human activity systems combining to make up the total environment which is:

the ever-present context for undertaking those tasks concerned with securing material and social welfare for ourselves and our families, as well as pursuing our search for and celebration of meaning in our lives. (J. Burnett-Prinsloo and Prinsloo, 1978, p. 13)

That the world means different things to different people, is the point of departure for a brief review of the variables which operate in environmental cognition. Although these forces are in fact interdependent and mutually related, for the purpose of analysis they will be considered separately. The role of the environment, defined as a source of information, has been dealt with in Chapter 7. The influence of the biological characteristics of individuals is the least variable factor in environmental cognition since most people have a similar physiological make-up and only a very small minority suffer from an inherent physical disability or reduced physical competence. The biological factor is thus not dealt with. Attention is directed here to the psychological, social and cultural dimensions of cognition.

7.4.1. The psychological system.

The physical world is idiosyncratic for each individual. Personal environmental conceptions diverge from one another even within the limits

set by human physiology and group standards. Private milieus differ markedly among people in different cultures, among individuals within the same social group, and for the same individual as child and as adult, at various times and places, and in various situations and moods. As Lowenthal (1966) has observed:

A man's feelings about space and traffic, smog and flood will differ in rain or shine, peace or war, and according to whether his stomach is empty, or full, or maybe overfull. (p. 129)

Each private milieu is unique, partly because no two persons can occupy the same point in space at the same time, and the physical environment is never precisely the same on successive occasions (unless, of course, it has been set up artificially in laboratory conditions), and partly because each individual chooses from and reacts to the environment in his own peculiar way. His particular "cognitive style" is a function of a wide spectrum of psychological variables.

The relation of cognition to other psychological processes is a general problem area in both the theoretical and empirical study of cognition (Ittelson et al, 1974, , p. 121). Cognition is inseparably linked to certain other aspects of psychological functioning. Cognitions are loaded with feelings and values and involve the use of information recorded and stored in one's memory system. Likewise cognition is

intimately related to personality factors, to the particular developmental stage and to the specific needs and goals of the individual.

The purpose and circumstances of cognition materially alter what is seen. The potential house-buyer sees a different house to that of a potential burglar. "Intent modifies the character of the world" (Lowenthal, 1961, p. 256). An open tract of natural landscape with a river running through it might be viewed by an industrialist as real estate with good investment potential for a water-intensive industrial undertaking, such as a paper-mill. On the other hand, a nature conservationist might view the same area of land as a beautiful and unique ecological zone, whilst a canoeist navigating the river might be aware only of the gradient and general conditions of the river. Circumstances apart, each person is distinctively himself. Lowenthal quotes Vernon's (1952) observation that

The individual carries with him into every perceptual situation.....his characteristic sensory abilities, intelligence, interests, and temperamental qualities... [and his] responses will be coloured and to some extent determined by these inherent individual qualities.(p.255)

Craik (1970) has investigated the role of personality in environmental cognition. He has suggested the existence of "environmental traits":

Individuals not only exhibit characteristic styles of relating to other persons, such as 'dominant', 'assertive', 'deferent', and so on, they also display enduring orientation toward the physical environment; an inventory of environment traits would permit the declaration: 'I am the sort of person who reacts in these ways to the molar physical environment!' (p. 86)

Another reason why the images which each person construes from a given environment are distinctive and unique is that all environmental information is inspired, filtered and distorted by feeling. The derelict house looks warm and hospitable to the homeless; Bruner and Klein (1960) found that coins appeared larger to the children of the poor.

This study does not attempt to comprehensively analyze the nature of these psychological variables and their interrelationships. It simply acknowledges that cognition is intimately related to the individual's psychological system which thus has a significant influence on his conception of the built environment.

7.4.2 The socio-cultural system

It has been stated (Chapter 3.4) that, although the position is taken that environmental knowledge is constructed by the individual in the

course of his environmental transactions, this position does not imply the absolute subjectivity of environmental knowledge. The way the individual conceptualizes and evaluates the built environment has both a personal and a collective dimension. Neither the built environment, nor cognition can be fully understood until they are seen in their socio-cultural context.

Lowenthal (1961, p. 260) has commented that "the surface of the earth is shaped for each person by refraction through cultural and personal lenses of custom and fancy."

Cognition comprizes individual mental processes; however, the concepts, or images which arise are largely a product of social and cultural forces. Cognition is a search for meaning and a process of imposing order on the world; by having a meaningful structure imposed on it, "the world is humanized and made habitable" (Rapoport, 1976, p. 222). The type of order imposed varies with the differing "cognitive styles" of different socio-cultural groups. Piaget has shown how the child from birth has an innate structuring ability which enables him to interact with and orientate himself in the built environment, thus establishing some kind of order. Piaget stressed the social basis of this cognitive structure; the social environment

in part determines the interactions from which the schemata stem:

Without interchange of thought and co-operation with others, the individual would never come to group his operations into a coherent whole: in this sense, therefore, operational grouping presupposes social life. (1950, p. 163)

Values, beliefs, attitudes which are held by the group play an important part in determining the schemata and concepts which individuals use to structure the physical environment. For example, the belief held by certain civilizations that the earth is flat resulted in the individuals of that group perceiving the horizon as the "edge of the world", beyond which lay an infinite drop into space. This concept of the earth as a flat disc-like form played a significant role in determining subsequent cognitive categories and orientational systems.

The relationship between people and the built environment is thus largely a social one. Husserl (1965, p. 189) argued that the individual's experience arises out of a common experience and that the constant foundation of man's thinking and experience is the "envi-
ring world of life", or "lebenswelt". Individual perspectives of the built environment can thus be seen as intersubjective rather than

subjective. This viewpoint is obviously phenomenological in character and avoids the simplistic approaches of objectivism and subjectivism.

The socio-cultural base of cognition is a necessary condition for the co-existence of members of particular social or cultural groups. Without basic concurrence as to the nature of the world and the way it is ordered, there could be no communication between people. Norberg-Schulz (1971), in his discourse on "existential space", notes that "our different individual worlds must have common basic structural properties to enable us to become part of society" (p. 38). People need to share certain cognitive structures and concepts if they are to communicate with each other. Adequate schemata, as well as the manipulation of symbol systems (such as language), are learned as a means of communication. An untenable situation would arise should every individual experience the built environment in a totally subjective or arbitrary way.

Environmental knowledge is a function of the roles that people play in society. For example, studies by numerous environmental psychologists (Canter, 1969b; Hershberger, 1970 a, 1974) have indicated that architects conceptualize the built environment in ways quite different from that of the general public. "Learning from Las Vegas" by Venturi et

al (1977) further highlights the necessity of distinguishing between expert and user viewpoints. Hershberger's initial research in this area focussed on whether architects do, in fact, comprehend the architectural environment differently from laymen, for either the representational or responsive levels of meaning and, if so, to discover to what this difference should be attributed. He concluded that there were pronounced differences between the architects and non-architects in their comprehension of architectural environments. It was evident that the professional education of the architects had a great deal to do with their way of comprehending the built environment. In fact, the results were so conclusive that Hershberger made the rather alarming comment that "the architect might be one of the worst [author's italics] persons to predict how laymen, the users of his buildings, would represent and respond to what he designs" (1974, p. 154).

Another example of how different roles affect environmental cognition is the familiar situation where the tourist, or visitor views a particular environment in a very different light from that of the inhabitants. The element of novelty is an important aspect of the tourists' environmental experience; what is familiar and mundane to the residents is "interesting" and "fascinating" to the visitors. Another factor

contributing to the discrepancies of tourist/resident cognition is the difference in the socio-cultural background, and hence world view, of these two groups of people. The average middle class Western tourist who visits Israel, for example, views the area of Jerusalem, known as Nachlaot as a miserable and uncomfortable slum. However, despite the delapidated condition of the buildings and the general overcrowding, the residents of Nachlaot, many of whom come from North African and Middle Eastern countries, find the environment very congenial to their style of living and do not wish to move to new accommodation in modern suburban apartment blocks.

The influence of language on cognition has been much debated. The Whorfian Hypothesis (Whorf 1956) suggests that language determines thought and our knowledge of reality; that is, language acts as a frame of reference through which we view the world.

We dissect nature along lines laid down by our native languages.....the world is presented in a kaleidoscopic flux of impressions which has to be organized in our minds - and this means largely by the linguistic systems of our minds. We cut nature up, organize it into concepts, and ascribe significances as we do, largely because we are parties to an agreement to organize it in this way - an agreement that holds throughout our speech community



Miserable slum or congenial
living environment ?

85 Nachlaot in Jerusalem, Israel.

and is codified in the patterns of our language.
(Whorf, 1956, p. 213)

However, whether language affects cognition at all, and if it does, the extent of its influence is still an open question. It does however, seem plausible that language plays a significant role in determining what environmental information is selected and how this information is classified. Eskimos, for example, have many different words for different types of snow and are able to distinguish a wide range of snow conditions. We, on the other hand, simply speak of "snow" and where the eskimo will notice fine distinctions, we tend to see a uniform type of snow (although we can be taught to recognise the different snow types). The main problem with Whorf's theory is that it is circular - different cultural groups see the world differently because they speak different languages, and conversely, we speak different languages because we see the world differently. Which comes first - language, cognition or reality?

In summary then, cognition as a process is far from being solely a mechanical response. The cognitive representations which are formed by individuals are a product of the interrelations between physiological, psychological, socio-cultural and physical environmental factors.

a product - a person's organized representation of some part of the spatial environment. Examples include a sketch map showing the route to your house; a list of the places downtown that you avoid because they are dangerous; a child's painting of his house and neighbourhood; the picture that comes to mind every time you try to cross town on the subway system, and the travel brochure that describes places that are worth visiting. Most importantly a cognitive map is a cross section representing the world at one instant in time. It reflects the world as some person believes it to be; it need not be correct. (p. 6).....

The cognitive map is, above all, a mental image in a person's brain. (p. 7)

However, "cognitive map" is a misleading and restrictive label. Firstly, the term implies map-like representations of the physical environment. It has been argued (Hart and Moore, 1973) that it begs the question to suggest that spatial relations are necessarily represented in a cartographic form and that the cognitive map is only one form of cognitive representation.

Rapoport (1977) concurs with this latter point, describing mental maps as "those specific spatial [author's italics] images which people have of the physical environment and which primarily affect spatial behavior" (p. 119). Secondly, the term leads to confusion regarding the

distinction between internal representations of the environment, that is, cognitive representations, and external representations such as drawings, maps, verbal reports. External representations enable us to infer internal representations and have been used in numerous experimental studies. Downs and Stea in their definition of the cognitive map fail to draw this distinction, resulting in a definition which is confusing and ambiguous. The examples of cognitive maps which they offer include both observable external representations - sketch map, list, painting, travel brochure - and internal cognitive representations - "the picture that comes to mind" - which cannot be directly observed.

Piaget (1951, pp. 67 - 72) has acknowledged the dual use of the term "representation". He has distinguished between representation in the sense of knowledge, which he has termed "cognitive representation" and representation in the sense of the re-presentation of absent realities, which he has termed "symbolic representation", or simply "symbolization". Cognitive representations are not directly observable and he thus further defines them as "internal" representations. On the other hand, symbolic representations are directly observable and "external", for example a portrait painting represents a particular person, a word represents a particular meaning, and so on.

The Environmental Image

In the previous chapter the processes of cognition were analyzed and certain theoretical conceptions were suggested regarding the way people acquire knowledge of the built environment. The concept of the image was introduced and broadly defined as the product of the cognitive system. In this chapter the nature and function of the image will be examined in more depth, giving a broad overview of how it relates to the physical environment and to human experience.

Since the processes and products of environmental cognition are intimately related and, in fact, form part of one overall system, it follows that a certain degree of overlap and repetition from the previous chapter is inevitable.

The diagram of the conceptual model of environmental cognition shows how the environmental image is formed through the cognitive processing and input selection - which is a function of the individual's "human action system" (Chapter 2.3) - of environmental stimulus information. The diagram graphically indicates feedback from the environmental image to the cognizing individual and to the environment, in what is a continuing system. It is thus suggested that the image is dialectically related to both the cognizer and the built environment.

8.1 THE IMPORTANCE OF IMAGE STUDIES

Since the environmental image is the mental representation that the person holds of the built environment, that is, the subjective knowledge of the environment, it follows that the image is a crucial factor in determining man's use and evaluation of the built environment. Pylshyn (1977) in his critique of mental imagery refers to the image as a fundamental aspect of human experience: "We cannot speak of consciousness without, at the same time, implicating the existence of images" (p.3).

Cognition as a process has been defined in the previous chapter as an intervening filtering between man and the environment; the product of this process - defined here as the image- thus refers to the resultant intervening construct which is related to, although not a copy of, the objective environment. If the present architectural environment does reflect largely untested assumptions made by the professional planners and designers about human preferences and behavior, then it follows that the systematic study of images is necessary if the gap is to be closed between planners, architects and policy makers, and the public.

This study does not attempt to reveal the precise content of environmental images held by particular people, but rather it aims to present a theoretical overview of the nature and function of the environmental

image in a more general sense. This can be seen as a prelude to possible future empirical research. A central theme is the importance of the image as a link between people and the built environment.

8.2 TERMINOLOGY

Before the discussion continues, it is essential that the sense in which the term "image" is used in this study be defined.

The field of environmental cognition is characterized by a fundamental confusion over terminology, particularly with regard to the concept of mental representation. Numerous different terms are used in the literature - "cognitive map", "mental map", "schema", "cognition", "mental representation", "image" - in a conceptually related sense, and are often used interchangeably. All are used to refer, in one way or another, to a cognitive representation of the physical environment.

The terms "cognitive map" and "mental map" were originally introduced by Tolman in 1948. In more recent times they have been used particularly by Downs and Stea in a comprehensive body of research (1973 a & b, 1977) which has made a significant impact in the field of environmental cognition. Downs and Stea (1977) define the cognitive map as

a product - a person's organized representation of some part of the spatial environment. Examples include a sketch map showing the route to your house; a list of the places downtown that you avoid because they are dangerous; a child's painting of his house and neighbourhood; the picture that comes to mind every time you try to cross town on the subway system, and the travel brochure that describes places that are worth visiting. Most importantly a cognitive map is a cross section representing the world at one instant in time. It reflects the world as some person believes it to be; it need not be correct. (p. 6).....

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distinction between internal representations of the environment, that is, cognitive representations, and external representations such as drawings, maps, verbal reports. External representations enable us to infer internal representations and have been used in numerous experimental studies. Downs and Stea in their definition of the cognitive map fail to draw this distinction, resulting in a definition which is confusing and ambiguous. The examples of cognitive maps which they offer include both observable external representations - sketch map, list, painting, travel brochure - and internal cognitive representations - "the picture that comes to mind" - which cannot be directly observed.

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The term "schema" has been used in environmental cognition studies to describe a cognitive representation of the environment. The terms "schema" and "image" are often used interchangeably. Rapoport (1977) has noted that "images" seem to be structures or schemata" (p.42). He thus implies that the two terms are synonymous.

Lee (1976) applied the notion of "schema" to his study of the neighbourhood concept. The findings from his empirical study carried out in Cambridge led to his formulation of the "neighbourhood in the mind" and later, to the use of the concept of "socio-spatial schema" to represent this. Lee defines socio-spatial schema as "an inner representation of both physical and social objects in an integrated form" (1976, p.37). However, the term "schema" has also been used in another sense in the literature; it has been used to refer to the more abstract cognitive representation (Jencks, 1969; Piaget, 1951). It is in this latter sense that the term "schema", or "schemata", has been used in this study. (cf. Chapter 7).

The term "image" has been used in a number of conceptually distinct ways and therefore some clarification is needed. The concept of imagery has been linked historically to both memory and thought. The linking of imagery to memory apparently originated in Western culture

as a mnemonic technique that was invented by Simonides about 2500 years ago. The connection between imagery and thought also goes back to antiquity. Aristotle wrote that it was impossible to think without mental pictures, and used the images of mnemonics to illustrate his statements about imagination and thought. (Paivio, 1977).

It seems that many contemporary psychologists who write on the subject use the term "image" to refer to a subjective mental representation, or sensation, which occurs in the absence of a stimulus. Academics have suggested that images are related to "indirect reactivations of former sensory or perceptual activity" (Bugelski, 1970, p.1002); or that they are "a faint subjective representation of a sensation or perception without an adequate sensory input" (Holt, 1964, p.255); or "the occurrence of perceptual processes in the absence of stimulation which normally gives rise to perception" (Hebb, 1966, p.41); or imagery is defined as "the ability of a subject to generate or synthesize a sensory-like datum in the absence of physical stimulation" (Weber and Bach, 1969, p.199).

However, it is not in this sense that the term "imagery" is used in this work. It is used in a broader, more comprehensive sense to refer to the picture, or internal model that people build up of the world

about them through the process of cognition; the stimulus information from the environment may or may not be present. In perceiving and experiencing a particular building the person forms an image, or cognitive representation, of that building, that is, in the presence of the stimulus information. Similarly, one retains in one's memory, to a greater or lesser extent, the image of particular buildings experienced in the past and this image may be consciously or unconsciously recalled in the absence of the original stimulus information.

The term "image" is used in this thesis to refer to subjective knowledge of the physical environment, to an individual's "mental representation of the parts of external reality known to him via any kind of experience" (Harrison and Sarre, 1971, p.352) and is synonymous with the terms, "cognition" (noun), "mental representation" and "cognitive representation".

It is used here in a way closely related to Lynch's concept of the image. He describes the environmental image as "the generalized mental picture of the exterior physical world that is held by an individual" (1960, p.4). Lynch, however, concentrates on the visual aspect of the image and neglects in his study to investigate the other dimensions of the image. This point will be dealt with later in this chapter. Norberg-Schulz (1971) in his analysis of architecture, bases his argument on a theory

of existential space. He demonstrates that "man's existence is dependent upon the establishment of a meaningful and coherent environmental image or 'existential space'." (p.114). His use of the concept of existential space to describe man's image of his environment thus corresponds with the concept of the environmental image postulated by this thesis.

The image is treated here, following Moore and Golledge (1976), as a hypothetical construct, that is, as

a proposition about hypothetical entities, processes or events which are not directly observable....[but] that there is reason to believe do [author's italics] exist, which are in principle [author's italics] observable (i.e., cognitive representations have correlates in other behavioral domains, e.g., physiological processes which could be measured under some ideal circumstances), but which can only be hypothesized at the present time". (p.8)

Thus, although images are covert processes and organizations of elements of knowledge which are not directly observable, they have an "allegedly real status" (p.8).

8.3. THE FUNCTION OF THE IMAGE.

In order to operate effectively in the environment one needs to have some mental conception of that environment. Images are the basis of

one's interactions with one's surroundings and, as Lynch (1960) has noted,

the image ... is used to interpret information and to guide action. The need to recognize and pattern our surroundings is so crucial, and has such long roots in the past, that this image has wide practical and emotional importance to the individual (p. 4) ... Our environmental image is still a fundamental part of our equipment for living. (p. 124)

The diagram of the model indicates feedback from the image to the cognizing individual, and from the image to the built environment. It has been suggested earlier in this chapter that the image is a fundamental aspect of human experience. Since the environmental image is defined as subjective knowledge of the environment and constitutes one's environmental reality, it follows that it must play a very important role in determining human consciousness. The way an individual or group conceptualizes a particular physical environment is influenced by, and ultimately exerts a reciprocal influence on, the "human action system" of that individual or group. It is in this sense that the image is seen as playing a dynamic role in man-environment relations.

8.3.1 Mediator of Cognition

The environmental image functions in the mediation of environmental knowledge. Images enable the individual to code, structure and store

environmental information and thus influence subsequent environmental conceptions. Lynch (1960), in his pioneering work on urban imagery, stresses man's need to find order in the built environment and his constant effort to reduce physical "chaos" to a meaningful pattern. He describes the reciprocal process by which environmental images, once established, influence the selection of environmental information and at the same time are themselves tested against the environmental input:

Environmental images are the result of a two-way process between the observer and his environment. The environment suggests distinctions and relations, and the observer- with great adaptability and in the light of his own purposes - selects, organizes, and endows with meaning what he sees. The image so developed now limits and emphasizes what is seen, while the image itself is being tested against the filtered perceptual input in a constant interacting process. (p.6)

This description, with its emphasis on the dynamic nature of the image, corresponds with the conceptual model of environmental cognition propounded in this thesis. The image is viewed as a product of cognitive processes and as a function of environmental and human factors. At the same time, the image once formed, influences the selection of environmental information and the processing of that information; it therefore plays a significant role in determining the development of subsequent images.

8.3.2 Mediator of Behavior.

The environmental image, as a partial and simplified representation of of the physical environment, forms an indispensable part of an individual's survival kit. Not only does it mediate cognition, but it is also assumed to be a crucial intervening variable between the built environment and man's behavior in that environment. Architects have in the last two decades been concerned with the behavioral phenomena referred to as "personal space" (Sommer, 1969), "home range" (Anderson and Tindal, 1972), "behavior settings" (Barker, 1968) and so on. Most of the research, however, deals with the ways in which behavior, related to personal space, home range, etc. are manifested; the literature reveals that there has been relatively little concern with the origin of the particular behavior. It is suggested in this section that there is a meaningful link between images and behavior. Reference is made to certain studies which do recognize this link. However it is difficult to discover the exact nature of this link, how action results from the images held. In effect, the image model is still incomplete because of this gap between image and behavior (Rapoport, 1977, p.45).

Boulding's book, "The Image" (1956) propounded the then somewhat heretical notion that all behavior was a function of knowledge, that is, the cognitive structure that he termed the "image". He refers to the

image as being subjective knowledge which "largely governs my behavior" (pp.5-6). This view has since become more acceptable in academic circles and has formed the foundation of a small, but growing, body of research in the field of environmental cognition. Charles Burnette (1974), for example, describes the role of the image in influencing human behavior:

The mental image.....of the environment which we 'anticipate' for our actions is a necessary part of the ability to plan behavior....to function at a place in a room, in a building, in a city, in the country, and in the world we depend on mental images of these environments. (p.170)

Downs and Stea (1973b) take a similar position stating that "human spatial behavior is dependent on the individual's cognitive map of the spatial environment" (p.9). Behavior does not occur in a vacuum; all overt behavior necessarily takes place in a physical (as well as non-physical) environment. The way one "sees", or knows, a particular environment, that is, the physical, evaluative and inferential aspects of one's mental model will determine largely how one behaves in that environment. The relationship between environmental cognition and behavior can be viewed in the framework of the dialectical model. Not only do images arise out of the individual's transactions with the environment (Chapter 7), but subsequent transactions, including overt behavior, are presumed to be mediated by previously constructed concep-



Behaviour does not occur in a vacuum:
all behaviour necessarily takes place in a physical environment.

86 "Mr and Mrs Clark and Percy",
acrylic on canvas by David Hockney.

tions. In G.T. Moore's words, "behavioral transactions with the environment are mediated in part by the individual's knowledge, or cognitive representations, of the total environment-behavior situation" (1976, p.144).

The fundamental premise which underlies much of this thought is the notion that the environment is what the person thinks it is, and he responds to it, behaviorally, emotionally and intellectually, as he conceives it to be. The environmental image which a person holds constitutes his only reality regarding that environment; it represents the environment as it is known to him. The cognitive environment is "no less functional than the geographical environment, since mental images predispose the manner in which we interact with the actual physical setting" (Ittelson et al, 1974 p.14).

In linking behavior with the image, the diagram of the model of environmental cognition may be extended to include a further flow from the image to categories of overt response. However, whilst this linkage is recognized and briefly discussed here, this thesis is more concerned with the nature of the known environment per se.

8.3.3. Role in the design process.

The feedback from the image to the environment can be explained by

viewing the built environment as a physical expression of the images held by the designers of that environment, that is, the designer's conceptual environment is manifested, or made visible, in the construction of the built environment. This notion can be traced back to the sixteenth century when (according to Wittkower, 1971, pp. 67-68) Barbaro, a noted teacher and scholar, wrote:

The artist first works in the intellect and conceives in the mind and symbolizes the exterior matter after the interior image, particularly in architecture.

Barbaro believed that the architect's images were based on an ideal, universal form of truth. Although this Platonic principle is rejected here, the notion of images - defined as the personal knowledge of a particular architect or non-professional designer in a specific situation - as the basis for design decisions remains relevant.

In more recent times, Rapoport (1976, 1977), Norberg-Schulz (1971) and Colquhoun (1971) have supported the contention that the built environment is designed and built to meet some conceptual image of environment. Norberg-Schulz has argued that man's spatial images are created through interaction with existing architectural spaces, and when these do not satisfy him, that is, when his image becomes confused or too unstable, he modifies the environment. Norberg-Schulz therefore defines architectural space "as a concretization of man's existential space" (p.12).

Rapoport takes a similar stance, noting that "designers always seem to match solutions against images whether it is an aboriginal making a spear, an artist trying to represent a landscape, city or building or an urban designer choosing among alternatives" (1977, p.40). According to Rapoport, design is the making concrete of some ideal environment. (In this he is following the theoretical propositions of Langer, 1953 and Eliade, 1961). He views design "as giving physical expression to an ideal environment embodied in images" (1977, p.42).

Alan Colquhoun (1971), in his convincing argument for a typological approach to design, contends that the design of artefacts (including buildings and objects) necessarily depends on the existence of an image, or cognitive model, of the form which the artefact should ideally take. He states that architecture pre-supposes "the existence of a given system of representation" (p.404). These cognitive representations, or images, he terms "typologies". Building typologies are thus type solutions to particular environmental problems. They have been culturally transmitted through time within socio-cultural groups and are housed in the minds of all people, including architects and the lay public. They have to a large extent determined the form and structure of man's built environment.

The Modern Movement in architecture attempted to break down the representational systems inherited from the past under the pretext that the type solutions, or models, of the pre-industrial era were no longer compatible within the context of a rapidly changing technology. However, Colquhoun argues that the creation of artefacts, including architecture, can never be based only on scientific determinism (that is, the application of sociological, biological and engineering sciences etc. to design), nor solely on intuition, neither can design be based on a fusion of both. He maintains that the reliance on typologies as a source of design solutions is inevitable. These typologies, which are consciously and unconsciously used in the shaping of the environment, are rooted in the socio-cultural system and form "part of a system of communications within society" (p. 396). The image held by the designer is communicated through the physical form which he creates and which corresponds as closely as possible to his mental image of that artefact.

The notion of the built environment as a physical expression of images can be used to explain the disparity between the apparent adequacy of the vernacular architecture of simple preliterate societies, and the widely criticized inadequacy of the contemporary architecture of Western civilization. The ABC triangle of Architect, Builder and Consumer with which modern industrial society is familiar, is generally absent

from tribal societies. The three functions are compressed, if not to an individual owner-builder, then to a community grouping based on kinship ties or gender rather than occupational specialization. For example, in the Xhosa tribe the women's domestic duties include the task of the construction and decoration of dwellings. Deviation from tradition is not likely amongst a group that has a clear and shared image of what buildings should be like. Certain patterns of building have persisted for centuries in certain pre-industrialized societies e.g. the thatched-roofed circular mud hut still used today in Southern Africa. The particular way of building is embedded deep into the group (or tribe) consciousness through the medium of legends, songs, and so on, so that each member of the group has a stable mental image of the form that a dwelling should take. The matching of the physical building with these commonly held images is relatively easy to achieve.

Ideally there should be this isomorphic relation between the environmental image and architecture. However, in our complex modern society with its division into highly specialized functions, this is not often achieved. Architecture reflects the cognitive environment of the architect who created it. This mental model may be at odds with those held by the people who must use the building. As Norberg-Schulz (1971) comments,



Patterns of building have
persisted for centuries.

Architectural space is given 'ready made' to the individual, that is, it is the creation of others and reflects their [author's italics] existential spaces.... and when we try to create architectural spaces which concretize our existential space, the result may not be liked by others. (p. 37)

It is not only the specialization of the building task in modern society that leads to alienated and unsatisfactory buildings; our society is characterized by a lack of cohesion amongst its people. Numerous socio-cultural groups, defined by occupational, educational, financial, racial, religious factors etc., result in a multiplicity of relatively idiosyncratic images. Also, a sophisticated technological society offers many more alternative choices. In this situation the matching process is much more difficult and incongruency, or mismatches, are frequent; that is buildings are frequently designed which do not relate to the mental conceptions held by the people who are to use the buildings, resulting in widespread user dissatisfaction. The increasing separation between designers and users which characterizes the position of the professional in our society today can be understood in these terms. It is thus important that architects search for the means to recognize, understand and reinforce or transform the mental images which people hold of architecture.

8.4. COMPONENTS OF THE IMAGE.

Environmental images have been defined in this study as stable mental conceptions, or models of environments. They can be thought of as "summarizing individuals' environmental knowledge, evaluations and preferences and as having implications for behavior" (Pocock and Hudson, 1978, p.3). However, images do not have implications only for behavior, but as has been discussed in the previous section, they also play an important role in influencing subsequent environmental cognition and in the design process. Thus the image may be considered to possess designative, appraisive and prescriptive components. These interrelated components of the image are shown in the diagram of the conceptual model of environmental cognition. This definition of the image is based on that advanced by Pocock (1973). He presents the above 3 categories in his model of environmental perception; however the ideas embodied in these categories are not developed. His subsequent work with Hudson (1978) applies this framework but fails to extend or develop the basic concept. The following section takes Pocock's categories as a useful starting point for an analysis of the multi-dimensional nature of the image.

8.4.1. The designative component.

The designative component refers to the informational content of the

image. It is that aspect of the image which describes and classifies environmental information, that is, the basic "whatness" and "whereness" of the image content. The designative component of the image relates to those physical attributes of the environment, such as size, shape, texture, colour, location, and so on.

8.4.1.1. Structural elements.

Norberg-Schulz (1971, pp. 17-27), in his existential interpretation of architecture, classified the basic constituent elements of the environmental image as places, paths and domains. This distinction is based on concepts established by Heidegger, Frey, R. Schwarz and Lynch and is related to Piaget's concept of topological schemata (Piaget and Inhelder 1956). Although Norberg-Schulz postulates this classification as the definitive description of the environmental image, his elements focus only on a part of the image, that is, they constitute only the designative component of the image. It is proposed here that the image is composed not only of designative, but of appraisive and prescriptive components as well. A discussion of the two latter components will follow after this section.

Norberg-Schulz demonstrates how his classification is applicable on several levels within a hierarchy of which the most comprehensive is the geographical level, while at the opposite end of the hierarchy is an order of furniture and still smaller objects.



Places, paths and domains.

- 88 (above) Piazza : Il Campo, Siena
89 (far left) Street : S.Gimignano,
Toscana
90 (left) District : Pisticci,
Basilicata.

The definition of place is based on factors of centrality, closure and proximity. Places are defined as centres, or foci where the meaningful events of existence are experienced. Places are also points of departure "from which we orient ourselves and take possession of the environment" (p.19). In other words, places are points in space to which we direct ourselves; in which we linger and live; and from which we depart. To be recognized as a place, a space needs a "pronounced limit or border" (p. 20). The place itself is experienced as "inside" in contrast to the surrounding "outside". Regarding proximity, Norberg-Schulz notes that "a place is characterized by a certain 'size'" (p.19). He quotes Rudolph Schwarz (1949):

A [place] can only become a home if it is small.....
The settlements must remain within an imaginable scale
if they are to become a home.

Whereas a place is determined by its having a "centre" and by the proximity of its enclosing elements, the path is imagined as a linear succession:

Primarily it is a direction to be followed towards a goal, but during the journey events happen and the path is also experienced as having a character of its own.
(Norberg-Schulz, 1971, p. 22)

Paths provide the organizing axes in space and are characterized by their

continuity.

Paths divide man's environment into areas which are known and areas which are relatively unknown. These qualitatively defined areas are termed "domains" by Norberg-Schulz. Domains are delimited in numerous ways : distinctive natural elements such as hills and rivers form borders between areas; land use, such as agriculture, industry or housing creates a particular "texture" and gives the area a consistent character; domains may also be defined by social conditions as is seen in the sectioning off of most cities into residential zones for different socio-economic groups. The domain is a "relatively unstructured 'ground', on which places and paths appear as more pronounced 'figures' " (p. 23). They serve a unifying function in environmental cognition, giving the perceived environment a spatial context. In a sense, domains are "places" because they are physically defined by closure and because they have certain uniformity of constituent characteristics. However, domains do not function as foci or goals; rather they surround places but remain outside of these places.

The designative component of the environmental image is therefore composed of a few basic elements which interact in characteristic ways. Although these element types have been isolated for the purpose of discussion, they are not experienced as independent, isolated entities.

For example, domains are structured with places, and defined and penetrated by paths; places occur within domains and are linked by paths; paths are given identity and tempo not only by their own form or by the places with they link, but also by the domains through which they pass. These elements - place, path and domain - are simply the raw material of the environmental image and must be patterned together to form a comprehensive image.

Images of houses may be seen as comprizing the three basic elements discussed above. However, at this scale of environment, the place element dominates. Our house is the place where we "take root day after day," for it is our "corner of the world ... it is our first universe, a real cosmos in every sense of the word" (Bachelard, 1964, p. 4). It is the place where the child first learns to understand his being in the world. It is the centre from which we depart and to which we return. Not only is the house itself conceptualized as a place but its internal structure is comprized of a series of subordinate places connected by paths. Objects and furniture may also serve as foci, or points of reference, within the house. For instance, the fireplace has since ancient times been the central focus of the dwelling and the dining table has traditionally been the place where the family congregates to eat.

An overlap between path and place is evident when the house is imaged as a sequence of spatial entities. In this sense the house is an architecturally structured "path", while at the same time, in relation to its surrounding space, or domain, it is a "place". The house and its site are physically separated from the street and from neighbouring buildings by various means (fences, walls, edge of lawn, etc.). That area which is outside the enclosure, and which has certain characteristic properties, forms the "domain" element of the total house image.

8.4.1.2. "The spirit of place is a great reality". (D.H. Lawrence, 1933, p. 12)

A place is defined by its being bounded and therefore distinguished from space such that there is a recognizable "inside" and "outside". However, a "sense of place", that is, the recognition of an environment as being distinctive, derives from more than physical structure and form; space is internalized as "place" when socio-psychological dimensions intervene. "A sense of place, however, comes from the further attribution of meaning to such physical form ... There is, therefore, a social or psychological interaction, a reciprocal relationship between place and person" (Pocock and Hudson. 1978, p. 81). There is an interaction between people and place - on the one hand, individual personality is reflected in one's

home and possessions and in the same way, the collective personality and values of a group of people is reflected in public places; and on the other hand, people are affected by place. People adopt different attitudes and behave differently in different places such as church, sports stadium, bus stop or supermarket.

8.4.1.3. The multimodal nature of the image.

The visual aspect of the image has been emphasized in much of the work done in the field of environmental imagery. For example, Venturi et al (1977) in their treatise on symbolism in architecture have stressed the visual impact of "big sign - little building" or "building as sign"; Lynch's (1960) definition of the image emphasizes the "seeing" aspect of imagery and imageability (pp. 6, 9). This has led many researchers to equate imagery with the cognitive equivalent of vision and has resulted in confusion between environmental perception and environmental cognition (Downs and Stea, 1973b). However the image depends on more than visual input - blind people also construct mental images of their physical environment. All the sense modalities combine to give an intergrated representation of any physical environment; the image is thus a multimodal representation. For example, the image of a particular restaurant is a composite of the characteristic cooking smells, the sounds of people talking, the clatter of cutlery and crockery, the air

temperature, the feel of the chairs as well as the lighting, use of colour and other visual effects.

However, although environmental experience is a totality contributed to by all the sensory systems, the dominance of the eye in Western society results in our images having a comparatively large visual content. Controlled experiments have been undertaken to investigate the role of the various sense modalities in the cognition of the physical environment. For instance, Southworth (1969), in an experiment using subjects in Boston, filtered out the auditory input from the city. He found that the removal of the sonic environment produced a cityscape "surrealistic in its peacefulness" (p. 61) but which at the same time was lacking in contrasts, sad and almost two-dimensional.

8.4.2. The appraisive component.

Images include both concrete and abstract stimulus information. The component of the image which relates to concrete physical attributes has been discussed above.

Leff (1978, p. 197) has noted that the attention of many theorists and researchers seems to have been riveted primarily on the purely structural aspects of environmental conceptualization. Questions about people's

knowledge of location and environmental structure have predominated, while questions about the role of affective response and social meaning have been relatively neglected.

Lynch (1960, p. 8) has analyzed the environmental image into three components : identity, structure and meaning. He defines identity as the distinction of an object from other things, "its recognition as a separable entity" (p. 8). Structure is the "spatial or pattern relation of the object to the observer and to other objects" (p. 8), which Lynch maintains forms an integral part of the image. Thus identity and structure together form part of the designative component; Lynch's meaning component forms a part of the appraisive aspect which is discussed in this section. Although Lynch recognized that the image was a compound of physical attributes and meaning, he chose to focus on the role of physical form, developing the hypothesis that an individual's knowledge of the city is a function of its "imageability".

This concept he defines as

that quality in a physical object which gives it a high probability of evoking a strong image in any given observer. It is that shape, colour or arrangement which facilitates the making of vividly identified, powerfully structured, highly useful mental images of the environment. (p. 9)

His work thus deliberately concentrated on the relation of physical features to the ways in which people's environmental images seemed to identify and structure urban surroundings. The meaning of these physical features was largely ignored. The results of his empirical work, showing how the images of the central areas of Boston, Jersey City and Los Angeles were structured by the citizens, verified his hypothesis. His research design has subsequently been replicated in a variety of cultural settings, including Ciudad Guyana in Venezuela (Appleyard, 1970), Milan and Rome in Italy (Francescato and Mebane, 1973) and Birmingham in England (Goodey et al, 1971) amongst others (cf. Chapter 4.3). These studies have however demonstrated something of the paucity of Lynch's image, with its emphasis on spatial and relational components and neglect of the evaluative and emotional elements of the image.

The development of environmental knowledge and a clear environmental image depends to some extent on the distinctiveness of the building form and its prominence in the environment. However, whilst it is obvious that physical attributes play an important part in determining environmental knowledge, the concept of imageability cannot be defined in specifically physical terms "Physical stimuli per se [authors' italics] do not exert an influence on the image directly proportional to their

objective prominence" (Pocock and Hudson, 1978, p. 33). In a study of central Birmingham, for instance, the two tallest buildings in the area, one rising to almost 153 metres, figured weakly in the public image (Goodey et al, 1971, p. 44). The cognitive representation depends upon more than visual input of concrete stimulus information.

"It is the attribute of significance which gives meaning to neutral environmental happening" (Ittelson, 1960, p. 34). That is, environmental images include evaluative and affective dimensions.

This appraisive component of the image, comprized of evaluative and affective elements, plays a very important role in man's experience of the built environment. Findings from numerous studies, (Gulick, 1963 ; Sieverts, 1967 ; Harrison and Howard, 1972 ; as well as the studies by Appleyard, 1970; Francescato and Mebane, 1973 and Goodey et al 1971, mentioned above), reveal that not only visual form, but affective and evaluative criteria are instrumental in the construction of environmental images. Images do not reflect simply the objective physical attributes of the built environment. The attitudes, values, beliefs and feelings which people have also contribute to the meanings which are attached to physical forms and thus to the connotative, symbolic and emotional content of the image.

8.4.2.1. The affective dimension.

The affective dimension of the image is concerned with man's emotional relationship to the environment. Feelings and emotions are brought into play in the cognition of the environment. The cognitive environment may be exciting, pleasing, annoying, boring, and so on. Affect and evaluation are interrelated factors. Evaluation of a particular building depends to a large extent on one's feelings about that building. As Rapoport puts it "environmental evaluation is more a matter of overall affective response than of a detached analysis of specific aspects" (Rapoport, 1977, p. 60). Similarly, one's preferences and evaluation of a building exerts a considerable influence on one's affective response to that building.

8.4.2.2. Social meaning.

Buildings and places become associated with particular social activity, so that in time, although the physical building as such is seen, the meaning that it acquires in the minds of people is not structural or physical, but social. Thus the conceptualization of that building is more concerned with symbolism, that is, with what the building represents, rather than with the actual physical structure.

Lee's (1976) research in the neighbourhoods of Cambridge revealed that

people's images of their neighbourhood environment "comprized a synthesis of the multiplicity of both social and physical [author's italics] interactions between the person and the environment" (Lee, 1976, p. 129). When asked whether they possessed a neighbourhood or not and if they did, what it was like, the majority of respondents neither could, nor wished to distinguish the physical from the social aspects of their neighbourhood. Lee thus used the term, "socio-spatial schema" to represent this inner representation of the environment that the normally mobile person possesses.

8.4.2.3. The evaluative dimension.

Inherent in the cognitive representation is an assessment factor which includes the subjective evaluation and preference ranking of the built environment. Values, purposes, norms and attitudes which people possess are brought into action in the process of cognition and the particular building is conceived of as pleasant, unpleasant, beautiful, ugly, better, worse, novel or common and so on.

Designative and appraisive components are interrelated and interdependent in the sense that the cognitive selection of information regarding the physical characteristics of a building is determined to a considerable extent by the meaning which is attached to that building. For example a

"middle class" architect may look at a "deteriorating slum" and see dilapidated, paint-peeled old buildings and dirty streets, while the residents of the area see their neighbours' homes in all of their particulars and streets active with children at play. A tourist, in the light of his own purpose, beliefs and values, will judge buildings on criteria quite different from those of a native. Similarly, the details of a building will appear quite differently to a maintenance man than to an art historian.

Research is being undertaken in the field of environmental cognition to identify the elements of environmental assessment. The Semantic Differential (Osgood et al, 1957) and Repertory Grid (Kelly, 1955) are two techniques originally developed in psychology, which have recently been adopted by geographers, planners, architects, environmental psychologists and others involved in the study of environmental cognition, to measure the subjective meaning which man attributes to the physical environment.

Hershberger (1974) has attempted to develop a definitive set of semantic differential scales applicable to designed environments and which fully cover the presentational (or designative), affective and evaluational areas of architectural representation. By reviewing research work utilizing semantic scales he extracted and analyzed the scales which predominated, reducing the almost infinite number of possible scales to a

comparatively small, yet comprehensive group.

Using the Semantic Differential technique, Sanoff (1974) conducted an experiment to assess the relation between satisfaction, and complexity, ambiguity and novelty. He focussed on the cognition of the visual properties of the environment, isolating all other stimulus inputs, such as auditory or olfactory. He concluded that the attributes of preferred environments appear to be "complexity", "stimulating", "sensuous", "dynamic", and so on. Less-preferred environments are defined in terms of such descriptors as "simplicity", "universal", "symmetry", "unobstrusiveness". Sanoff also found that the attributes "interest" and "satisfaction" were positively associated with affective judgements of the environments described as novel, dynamic, stimulating, bold, sensuous and individual. As Sanoff points out (p. 254), environmental descriptions are amenable to scientific investigation. However, additional techniques need to be explored, partially to test the efficacy of the Semantic Differential and partially to generate further insights into response patterns to visual fields.

The measurement of meaning, with a minimum of interviewer influence, by the use of the Repertory Grid method is well illustrated in a study of the image of Bath (Harrison and Sarre, 1975). It was hypothesized

that the evaluative and affective components would account for the greater part of the image content. However, it was found that the bulk of the constructs elicited were of a descriptive and relational nature. Despite the relative disproportionality, the importance of the evaluative and affective constructs is not undermined, they still constitute a substantial and significant part of the image.

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These techniques (that is, Repertory Grid and Semantic Differential) which elicit information about subjective images have contributed to some extent to this area of enquiry. However, inherent in these techniques which depend on verbal responses are certain methodological problems. These will be discussed later in this Chapter.

8.4.3. The prescriptive component.

The third component of the image relates to predictions and inferences of both a designative and appraisive nature. This component gives to the image continuity and meaning so that the image does not simply represent one's immediate impressions of a particular environment in isolation. The image is slotted into the pattern of the individual's experience, enabling him to project back into the past and forward into the future. By extrapolating from the immediate environmental information as well as from a body of stored images, the gestalt is

closed to create a composite and coherent picture of reality. Cognition of the physical environment is a composite of perception, memory, logic and faith. Lowenthal (1961, p. 251) quotes the example from Descartes, where, looking down from a window, we say that we see men and women, when in fact we perceive no more than parts of hats and coats. That is, it is inferred from the information immediately available - bits of hats and coats moving in the street - that people are walking there.

The predictive and inferential nature of cognition has been discussed in Chapter 7 where it was shown that environmental cognition can be viewed as the creation of certainty out of uncertainty or probability. The individual makes hypotheses regarding the nature of the physical environment and predicts the consequences of his actions in that environment. These predictions are then tested. The overall function of environmental cognition is not, according to Ittelson et al (1974, p. 124), "to reveal present reality nor to recall past reality : rather it is to predict the future". Cognitive representations can thus be seen as prognostic directives for behavior.

In drawing from our recorded images of past environments, in projecting into the future with predictions and in making inferences from the available stimulus information against the backdrop of one's emotional and evaluative response, cognition, and the resultant cognitive

representation, can be seen to furnish directives for action. Thus the prescriptive component of the image forms a fundamental and integral part of the content of the environmental image.

8.5. THE RELATIONSHIP OF THE IMAGE TO REALITY.

The function of the cognitive process is to reduce the information that is available from the environment and to make a basically chaotic environment orderly, predictable and manageable. Through imposing a structure on the environment, the cognitive mechanism selects information and processes it (cf. Chapter 7) ; the resulting images are thus partial and simplified representations of the environment and are not necessarily isomorphic to the objective environment. However, they may not be very "accurate", but they are nonetheless real to the persons who have them and, as Stea (1974, p. 157) puts it, "the idea or image of a building is as important as the building itself." Kates (1970) has summed up the relationship of the image to reality:

There is an environment in the minds of men
[which for] the human concerned, is no less real than
the external ambience despite its existence solely in
the form of perceptions, cognitions, attitudes, beliefs
and behavior. (p. 648)

Questions regarding the relationship of knowledge to reality, and the

nature of reality are the classical concerns of epistemology. These problems form the point of departure for Piaget's theory of the development of the child's conception of space (1963). As has been discussed in earlier chapters, Piaget has empirically validated the Kantian contention that what constitutes the environment for a particular organism is an intellectual construction by that organism. That is, what is taken to be real is a product of an act of knowing. Although it is accepted that an empirical reality does not exist independent of mind, it is argued that this reality can only be apprehended through the cognitive processes of man. Kant argued that there can be no complete understanding of truth in either sense or reason; thus it is postulated that instead of the image ever representing exactly what is real, what we take to be real is a construction of thought. Since each individual views and reconstructs the environment within his total environmental context, that is, according to his own assumptions, beliefs, values and life experience, the images developed of a particular physical environment vary greatly across different individuals and groups. Each of these images however, constitutes a reality and, in an experiential sense, are equally valid and true. Moore and Gollidge (1976) have noted that

No one person's or group's image of the environment is more "accurate" or true than another's. (p. 4)

We can however assume that there is considerable correspondence between the environment as people conceive it to be and as it actually is. The fact that the human species has survived supports this assumption. As Lowenthal (1961) expresses it,

If the picture of the world in our heads were not fairly consistent with the world outside, we should be unable to survive in any environment other than a mental hospital. (p. 250)

8.6. THE PUBLIC DIMENSION OF THE IMAGE.

Whilst environmental images are by their very nature idiosyncratic, each individual having developed his own inner representation of the built environment, the images of members of the same group have at the same time certain shared properties. It has been argued in this study that the construction of environmental images is a function of the total environment within which the individual operates. Cognition is influenced by the society and place to which the individual belongs; shared needs, ideals and values induce common or group images.

Images show regularities and systematic inter-relationships so that groups of people are organized groups because they share images. Communication between people is possible only to the extent that meaning and imagery are shared. This general consensus of agreement, or group

image is one of the foundations of community. This theme runs through Boulding's book, "The Image" (1956) where the term "public image" was used and defined as the "basic bond of any society, culture, sub-culture or organization" (p. 64). The same premise underlies the work of Lynch (1960), who working in the specific area of urban imagery, investigated the

common mental pictures carried by large numbers of a city's inhabitants: areas of agreement which might be expected to appear in the interaction of a simple physical reality, a common culture, and a basic physiological nature. (p. 7)

Images influence the way the group manipulates its environment and thus has a great effect on the form and style of the group's architecture (cf. Chapter 8.3.3.). At the same time, the social organization and the existing built environment help to transmit and develop particular images in the group. The socio-physical environment and the image are thus dialectically related.

8.7. MEASURING THE IMAGE.

Inherent in the study of images there is a fundamental methodological problem. The essence of the problem is that, by definition, environmental images exist as psychological entities "inside our heads." In

this sense, they lack a physical existence and cannot be measured in the way that one would measure the attributes of a physical object. Since images are covert and nonobservable, their existence and characteristic properties can only be inferred from overt responses. Another problem inherent in the measurement of images, is that cognitive information is unique to each individual. Researchers interested in determining the extent, organization, or other characteristics of an individual's knowledge of the environment, face a very fundamental problem in trying to extract that information from the individual. This extraction process is perhaps the most critical problem associated with empirical work in this area, for the analytical devices subsequently used on extracted information rely very much for their validity on the way that the desired knowledge is obtained and objectively presented for analysis. If we are to penetrate this "unique experience" barrier and to discover the nature and content of environmental images we must have satisfactory methodologies to elicit environmental knowledge.

Initiatives in the study of environmental images have sprung from a variety of disciplinary sources, each tending to have its own methodological and philosophical stance. Studies in environmental images have used a wide range of methods devised by numerous disciplines - sociology, psychology, geography, architecture and planning.

Golledge (1976, pp. 302-310) has classified the enormous range of methods used to elicit cognitive information about the physical environment into four main procedures: 1) experimenter observation in naturalistic or controlled situations 2) reconstructions of people's cognitive representations as manifested in literature, paintings and other art forms 3) analysis of external representations of environmental information contained in the minds of subjects 4) the uncovering of "latent" information about environments through the use of indirect judgmental tasks. Golledge has summarized some of the major methods used to extract environmental information from subject populations. He has tabulated brief summaries of a range of techniques, their related procedures and examples of the use of each method (pp. 303-305). This table is reproduced here. However, it must be pointed out that this table does not represent a comprehensive picture of environmental cognition methodology, it merely lists some of the major methods that have been used by contemporary researchers.

TABLE 1
Methods for Extracting Environmental Cognition Information

<i>Method</i>	<i>Procedure</i>	<i>Subject Skill</i>	<i>External Representational Form</i>	<i>Example</i>
Experimenter observation in naturalistic or controlled situations	Experimenter observes or tracks movements through actual environments (e.g., crawl patterns, search behavior, overt spatial activity, actual way-finding, etc.)	Cognitive Concrete Psycho- motoric	Observations Reports Maps Tables	Lynch (1960) Marble (1967) Ladd (1970) Jones (1972)

TABLE 1 (continued)

<i>Method</i>	<i>Procedure</i>	<i>Subject Skill</i>	<i>External Representational Form</i>	<i>Example</i>
				Devlin (1973) Zannaras (1973) R. Kaplan, Chap. 3 Werner (1948) Piaget and Inhelder (1956) Hart (1974)
	Experimenter infers degrees of cognitive knowledge from behavior in unstructured "clinical" situations	Cognitive Concrete Motoric	Charts Profiles	Downs (1970a) Wish (1972) Zannaras (1973) Golledge et al. (1975)
	Subjects reveal environmental knowledge in the process of sorting or grouping elements of actual or simulated environments	Cognitive Abstract Relational	Lists Tables Composite maps	Ittelson (1951) Milgram (1970) Saegert (1973) Acredolo, Chap. 13
	Subjects adopt roles or perform acts in simulated and/or real environments	Cognitive Abstract Relational	Photographs Tables	Piaget et al. (1960) Blaut and Stea (1969) Laurendeau and Pinard (1970) Mark (1972) Hart (1974)
	Subjects arrange toys or objects representing environmental elements or model environments, and experimenter observes the sequence of acts in positioning elements and/or using the environment	Cognitive Concrete Motoric	Analog models	Tolman (1948) Peters (1973)
	Experimenter deduces cognitive information from nonhuman activities (e.g., animal acts, machine simulation)	Cognitive Psychomotor	Observational schedules Tables	

<i>Method</i>	<i>Procedure</i>	<i>Subject Skill</i>	<i>External Representational Form</i>	<i>Example</i>
Historical reconstructions	Experimenter deduces environmental knowledge from written descriptions (novels, poems, etc.) and/or past pictorial representations of environments, usually from horizontal or oblique perspectives	Affective Psycho-motor Linguistic	Novels Poems Paintings Philosophies Sketches Diaries Content analysis	Lowenthal and Prince (1964) Heathcote (1965) Gleason (1972) Bowden (1975) Tuan, Chap. 23 Shin, Chap. 24 Lloyd, Chap. 25
Analysis of external representations—participatory activities	Subjects are asked to write descriptions of what they are aware of in environments	Affective Psycho-motor Linguistic	Written reports Contact analysis Item analysis	Lynch and Rivkin (1959) Carr and Schissler (1969) Appleyard (1969a) Winkel et al. (1969)
	Subjects are asked to describe orally a given environment	Affective Linguistic	Oral reports Type Transcriptions Interview Protocols	Lynch (1960) Carr and Schissler (1969) Gittins (1969) Craig (1970a) Moore (1973b) Zannaras (1973)
	Subjects draw sketches or sketch maps representing environments	Affective Graphic Relational	Pictorial sketches Sketch maps Quantitative and structural analyses	Lynch (1960) Shemyakin (1962) Stea (1969d) Appleyard (1970b) Ladd (1970) Moore (1973b) Wood (1973a)

<i>Method</i>	<i>Procedure</i>	<i>Subject Skill</i>	<i>External Representational Form</i>	<i>Example</i>
	Subjects arrange toys or make models representing environments	Affective Cognitive Concrete Motoric Relational	Models Arrangements of toys	Piaget et al. (1960) Blaut and Stea (1969) Mark and Silverman (1971) Stea (1973) Hart (1974) Stea, Chap. 9
	Subjects show existence, location, proximity, or other spatial relations of environmental elements; use of symbols to represent such elements	Cognitive Graphic Abstract Relational	Base maps with overlays Notation systems	Lynch (1960) Thiel (1961) Appleyard (1969a) Wood and Beck, Chap. 32
	Subjects asked to identify photographs, models, etc.	Affective Motoric Abstract Relational	Verbal Protocols	Piaget and Inhelder (1956) Laurendeau and Pinard (1970) Stea and Blaut (1973b) Zannaras (1973)
Indirect judgmental tasks	Selection of constructs which reveal environmental information; adjective checklists, semantic differentials, repertory grid test, etc.	Cognitive Abstract Relational	Word lists Tables Graphs Grids	Kelly (1950) Downs (1973) Honikman, Chap. 7 Harrison and Sarre, Chap. 34 Golant and Burton Chap. 33
	Paired proximity judgments and other scaling devices that allow specification of latent structure in environmental information	Cognitive Abstract Relational	Maps Tables	Briggs (1973a) Lowrey (1973) Golledge et al. (1975) Cadwallader (1973) Golant and Burton, Chap. 33
	Projective tests (e.g., T.A.T.)	Affective Abstract Relational	Verbal stories	Burton et al. (1969) Saarinen (1971)

Image studies are often limited by the myth that all such studies are restricted to making statements about the environmental knowledge of one individual. While every mental representation of the environment is unique, it also has many shared properties. The more homogeneous the group in terms of age and experience, the more overlap we might expect between the mental images. Unless used in clinical work, such as Kelly's Repertory Grid technique, most research experiments to measure the image attempt to generalize from groups of individuals in terms of the structure, content and role of their environmental images. If research into environmental imagery is to be at all applicable to the design profession, such generalization must be built into the research design.

Conclusion

This thesis has investigated the man-environment interface using a cognitive perspective. A holistic, multidisciplinary approach using Talcott Parsons' "human action system" as a frame of reference has been adopted. A theoretical model of environmental cognition, which examines the relations between the built environment, the total environment of the cognizer, and the image, has formed the focus of study and has provided an overview and explanation of the complex transactional nature of man's relationship with the built environment.

This chapter presents a brief summary of the main points which support the contention that cognition is the critical link in the man-environment relationship and the mental process that underlies all behavioural response and experiential reaction with respect to the built environment (cf. Chapter 5.1.1). Finally, it puts forward some ideas regarding the broad implications of these findings for the design profession.

9.1 SUMMARY

Environmental cognition has been defined here as the psychological process whereby the person comes to know the physical environment. The product of this process, that is, the subjective knowledge of the environment, has been identified as the image. Cognition and the image are described as a function of the interrelations between physiological, psychological, sociocultural and physical environment factors.

Because the image has a multidimensional nature - designative, appraisive and prescriptive dimensions - the cognitive model accounts for the many levels of environmental response. Images are a compound of both abstract and concrete elements as well as having an inferential and predictive component.

The physical environment has been defined as a source of information - the environment does not simply stimulate a passive individual's senses, but rather it offers information which, in order to be comprehended, is actively selected and synthesised by the cognizing individual as he acts within his total contextual situation. Environmental cognition thus plays a vital role as an information-

processing system whereby the objective reality of the physical environment is translated into subjective reality.

Since cognition is the source of all environmental consciousness - man has no direct access to the objective reality of the physical world but can only "grasp" that reality through an active cognitive construction - it follows that the cognitive mechanism is a fundamental process in determining man's behavioural, intellectual and emotional response to the built environment.

Further, man's action in the physical environment is inextricably related to his cognition of that environment for it is through his active participation in the environment that the individual comes to know and experience that environment. At the same time his behaviour in the environment is a function of how he cognizes that environment. It follows that man's behaviour in the environment can be explained in terms of the cognitive model.

Cognition is also a forward-looking process which plays a predictive role in man's relationship with the physical environment. In the process of cognition, the individual makes hypotheses regarding the nature of the physical environment and predicts the consequences of his actions in that environment. The predictions are then tested and

so the individual, through the interplay of action and cognition in different environmental situations, gradually builds up a knowledge of the built environment and a repertoire of appropriate responses to it.

On the intellectual level, man's inherent need to impose order and meaning on the physical environment is satisfied (at least in part) through the cognitive process. This process, whereby the enormous load of information provided by an intrinsically chaotic environment is selected, decoded and organized, therefore transforms the world psychologically into a coherent and manageable place within which the individual can live a healthy and comfortable life. The actual choice of information and the nature of the resultant image are a function of a dynamic interaction between the inner organismic factors which the individual brings to the situation, and the external socio-physical factors, as well as feedback from previous cognitive experience.

Cognition and the resultant image form the basis for design decisions, that is, the built environment is designed and built to meet some conceptual image of environment held by the designer. The form and structure of man's built environment can thus be seen as a physical manifestation of the designer's cognitive environment. The inadequacy of much contemporary architecture can be explained in terms of this notion of the built

environment as a physical expression of environmental images: the images of the architect which underlie his design decisions are often at variance with those held by the people who will use his buildings, thus such buildings are found to be alien and unpleasant by the users.

The analysis of cognition and the image in the context of man's relationship to the built environment reveals the fundamental role that these processes play in determining man's behavioural response (including design) and experiential reaction towards the built environment. It is concluded that the hypothesis that cognition is the critical link in the man-environment relationship is a valid assumption and one that warrants further investigation as the key to a more profound understanding of the man-environment interface.

9.2 IMPLICATIONS FOR THE DESIGN PROFESSION

This study, in examining the role of cognition in determining man's environmental experience and behaviour, has reinforced the contention (introduced in Chapter 1) that the architect, if he is to act in a socially responsible manner and to be at all effective in contributing towards an improved quality of human life, must acquire an understanding of the mental constructs by which people experience their total environment, including the built environment.

This section discusses the problem of the professional designer's role in society today, and suggests directives for remedial action.

9.2.1 The role of the professional designer

The purpose of building has since its inception been to provide people with a physical environment that enhances and enriches the quality of life by creating opportunities for the development of human potentials. However, today in the Western world, building activity, directed largely by the professional architect, has been reduced to the production of environments, which if not socially destructive, play no part in the amelioration of the human condition. Numerous factors have contributed to this situation; of these, ignorance and a lack of concern for the different cognitive and value structures of building users play a significant role and have led to the current professional arrogance where the architect operates solely from his own personal cognitive state and that of the elitist professional paradigm, resulting in an alien and incongruent environment. The architect, operating in a counter-productive fashion, thus negates the most fundamental function of architecture. This self-defeating activity of the design profession has led to the present situation where the public image of the architect has been eroded to the point where his credibility is severely threatened.

Two major factors tend to undermine the effectiveness of the architect

in society: firstly, the current professional paradigm stresses the positivistic, technological and economic dimensions of the building operation resulting in a "univalent" (Jencks, 1973) utilitarian architecture with very little human content for the building users. Secondly, and even more problematic, the very nature of the architect - his middle-class social background (that is, in most cases), his elitist education - tends to alienate him from those people for whom he designs. His cognitive structures and images which form the basis of his design decisions are usually incongruent with those held by the layman. The architect can thus be seen as an obstacle, rather than contributor, to human development.

A rapprochement between architecture and social reality is necessary so that the "applied art of architecture [author's italics] can be resurrected and made again part of the human experience from which the Modern Movement seems to have divorced it" (Blake, 1977, p. 162).

An alternative to specialist-designed buildings is spontaneous or vernacular architecture. The humaneness and "good fit" of these non-professionally designed environments can be attributed to their being

not produced by a few intellectuals or specialists but by the spontaneous and continuing activity of a whole people with a common heritage, acting under a community of experience. (P. Belluschi, as quoted by Rudofsky, 1964, p. 3)

However, although due to the complex nature of our Western civilisation, it is not feasible to return wholly to this form of building production, the specialist designer has much to learn from "architecture without architects".

The practise of professional architecture is by its very nature a socio-political activity insofar as the architect, as "omniscient specialist" holds the power to prescribe and determine what he considers to be the appropriate environment for particular people. However, it is essential that this power be wielded in a socially responsible manner which recognizes and accommodates the different world views, beliefs and values of those for whom the architect designs. If the architectural profession is to regain its status in society, it is expedient for the architect to relinquish his current role as 'dictator' and to realign himself as agent of the people, thereby using his skills to concretize the needs and aspirations of the people. This new role demands that the architect recognize and accept his social responsibilities and adopt a more humanistic approach to architectural problems. Peter Shepherd (quoted by MacEwan, 1974) refers to the current crisis in architecture and the need for a more responsible professional attitude.

they [architects] seem oblivious or even contemptuous of the fact that much of their work is hated by the people who live with it; they tend to accuse the public of lack of taste for not appreciating the formal qualities of brutal and inhumane buildings which one can only assume to have been built for the admiration

of other architects. Nothing is more urgent for the future of architecture than that architects should develop a deeper sense of responsibility [italics added] as the creators of a large part of our environment. . . (p. 5)

In adopting a socially responsible attitude, one of the urgent tasks for the profession is the critical examination of its current paradigm and mode of practise in the context of the larger society within which it operates as a sub-culture. Running parallel with this is the need to develop a conscious awareness of the cognitive constructs held by the people for whom the buildings are designed. The designer needs some understanding of how the various user groups "will comprehend and use the buildings he designs" (Hershberger and Cass, 1974, p.118). Unless architectural design decisions are informed by a basic understanding of images, it is doubtful if the techniques of contemporary architectural practise can ever be effective in producing buildings which are meaningful and relevant to those people who use them. Thus it is important that architects search for the means to identify and understand, and to reinforce or transform the mental images which people have of the built environment.

It is in this respect that the study presented in the preceding chapters offers a contribution to alleviating the current crisis in architecture. This study, which draws on the theories and research findings from a wide range of human sciences, represents an attempt to gain insight into the cognitive dimensions of man's interaction with the built environment, so that the knowledge thus acquired might ultimately feed through to inform the design process and so contribute towards the realisation of a more humane and socially supportive built environment. It is appreciated that a theoretical discourse of this nature is clearly not directly applicable to decision-making in specific architectural problem situations. However, it does form a fundamental and essential step in that direction in that it forms a part of the necessary theoretical background for the practise of a socially responsible architecture.

It must be noted that the purpose of using research from the human sciences as a tool in the design process, is not to reduce the role of the architect but to allow him to become more effective and innovative in fulfilling his role. However, one must not over-estimate the value of incorporating the findings

of the human sciences in the design process - no miracle solutions will automatically ensue. It remains the function of the architect to evaluate the data and to interpret it creatively in physical form.

9.2.2 Re-examination of the design process

However, the exploration of environmental cognition together with the re-assessment of the operant architectural ideology cannot on their own provide the means to achieve an improved quality of built environment. Numerous other factors intervene, of which one of the most important is the need for new professional methods of design.

The current linear model emphasizes those activities involved in solving problems and those involved with the construction of buildings. Relatively little attention has been directed towards the definition of the problem and the evaluation of the solution in use. An approach is needed which recognizes that there is "considerable feedback and feedforward in the development of any architectural solution" (Lang and Burnette, 1974, p.43).

The program, or brief, in which the problem is defined is, in the current solution-orientated approach of architectural practise, usually nothing more than an inventory of metric dimensions applied to the number of people to be accommodated; the profile of the people is usually limited to simple sociological terms of sex, age and role, and their needs and activities are enumerated and interpreted in terms of a set of minimum dimensions. Qualitative aspects are of secondary importance and are usually stated in terms of performance standards such as thermal comfort level, decibel ratings, etc. The so-called "objective" scientific analysis does not suffice as it fails to reveal the subjective, experiential aspect of man in the built environment. The importance of understanding how people perceive, conceptualize and evaluate the built environment is borne out by the main theme of this thesis, namely, that environmental cognition forms the basis of man's interaction with the built environment. An amplified program would provide the architect with a directive for design which, in acknowledging the realities beyond his personal experience, intuition and heresay, takes into account the subjective mental images of the potential users.

The design profession has never established and maintained channels that would accommodate a ready flow of feedback from the lay public. With no systematic process for testing the acceptability of design

solutions in terms of user satisfaction, no cumulative body of knowledge about buildings in use has been built up. The assumptions and design criteria upon which the architect bases his design decisions are seldom checked and are rightly or wrongly re-used again and again, often perpetuating inadequate design solutions. Robert Sommer (1972) discussing the inadequacies of the design product and the consequent need for an evaluation phase in the design process, states:

The lack of evaluational data not only causes the neglect of good design features, and encourages an attitude of novelty for its own sake, since no one knows what items are good or bad, but it also results in the perpetuation of bad design solutions. Reinventing the wheel for each problem is bad enough, but reinventing a square or lopsided wheel is even worse. (p.90)

As has been discussed earlier, the success of the vernacular architecture of primitive societies can largely be attributed to continual feedback from the building users who react directly to any deficiency in their buildings. The feedback is automatic and direct; remedial action is taken immediately it becomes necessary.

Post-construction evaluation needs to become an integral part of the design process. Each new building then becomes an "hypothesis"

about the relationship between people and the designed environment - an hypothesis which is tested empirically in a process of evaluation. Evaluation, in addition to testing design decisions and validating programming data, generates new information for future programs. These programs are in turn tested when the completed building is evaluated. Thus evaluation and program formulation are interdependent activities which should form part of a dynamic ongoing design process.

9.3 EPILOGUE

However small the impact of architecture might be in the lives of people, it does play some part in contributing to the quality of life. As Constance Perin (1970) has put it:

Creating and recreating the physical environment may not be the most important thing a society does for enriching the potentialities of its members, but as long as it is being done, an integrity appropriate to it should be sought. (p.25)

This thesis has stressed the need for architects to be fully aware of the human implications of the buildings they design; this awareness must necessarily include an understanding and recognition of the

subjective dimensions of human existence. By understanding the principles of environmental cognition, the architect can play a positive role in creating built environments which serve society in a constructive manner.

Vitruvius, the Roman authority on architecture, in defining the necessary attributes of the ideal architect, wrote:

Let him be educated, skilful with pencil, instructed in geometry, know much history, have followed the philosophers with attention, understand music, have some knowledge of medicine, know the opinions of the jurists, and be acquainted with astronomy and the theory of the heavens. (Translated by Morgan, 1914; quoted by Broadbent, 1974, p.4)

This list of qualities recognizes the necessity for architects to have an all-round knowledge of human life. However, it fails to specifically mention the need for the architect to have a clear understanding of the internal processes of the human being in his intercourse with the socio-physical environment. It is suggested by this thesis that the above quotation may be expanded by adding: "and let him understand the nature of the phenomenal dimension of man's relationship to the built environment".

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