

**ENVIRONMENTAL STRESS: AN ECOLOGICAL APPROACH  
WITH SPECIAL REFERENCE TO HOUSING**

**Mete Balit Turan**

**Submitted in partial fulfillment  
of the requirements for  
The Degree of Doctor of Philosophy  
under the Executive Committee  
of the Graduate School of Arts and Sciences  
Columbia University  
1974**

ABSTRACT

ENVIRONMENTAL STRESS: AN ECOLOGICAL APPROACH  
WITH SPECIAL REFERENCE TO HOUSING

Metec Halit Turan

When elements of the total design process acquire an existence independent of man, objectification, the personalization of the environmental elements, may lead to alienation. The sources of alienation in the environmental setting are the states of overcontrol and undercontrol. The condition of overcontrol arises from extreme inflexibility, inadequate recognition of design problems, over-emphasis on efficiency, or a demand for individual conformity. The condition of undercontrol emerges from a lack of realism in the relationship between the designed environment and life activities or from the isolation of the individual from his environment. Most present treatments of the man-environment relationship do not offer a realistic solution to the alienation problem; they force a passivity upon the individual which is contrary to the processes of human consciousness.

Realism in the design process can be summarized as environmental adequacy. Environmental adequacy (provisions for the dynamic characteristics of life activity) can be achieved only through the recognition of the dialectics of meaning-value-need. An individual's total conception of meaning emerges from consciousness, retrospection, and the historical social process. Value is determined to be a cultural

product affecting man's social attitudes. Needs occur in a hierarchical order in which the lower needs (physiological) must be satisfied before the higher needs (psychological) become dominant.

Housing is a complex process which must be viewed not in terms of separate components, but in terms of their interconnections. The concept of environmental stress can be considered as a unit which links the different but related disciplines of physiology, psychology, sociology, architecture, etc., to the housing design process. A conceptual model of environmental stress can be formulated with reference to the physical stress model. Three concepts essential to this study are: environmental load, an input which poses a threat to the desired level of maintenance of a system; environmental stress, a state which arises after environmental loads are introduced; and environmental strain, a disturbance which results from the stress state if coping is unsuccessful.

An individual's adaptation to the changing environmental conditions, within tolerance limits, occurs basically at two levels: by the efforts of the biological organism and through the cognitive appraisal process. Maladaptation, or unsuccessful coping with adverse environmental forces, is likely to create a stress state. Stress situations arising from primary (viscerogenic) needs are less complex and enigmatic than the secondary (psychogenic) needs, which do not depend upon the direct impact of stimuli as much as upon the individual's cognitive appraisal of stress situations. Effectance (the desire to explore and manipulate the environment), is an essential aspect of motivation which must be incorporated into the design element. A brief review of possible

stress situations in various environmental elements--thermal, atmospheric and olfactory, sonic, and luminous--affirms the necessity of the individual's control of his environment. Efficacy of coping depends upon a level of competence to overcome the impediments of unpredictability, helplessness, lack of alternatives and choices, and uncontrollability; the intensity of adverse aftereffects (especially those of a psychological nature) is a function of these impediments.

The process of man's cultural adaptation to the forces of the total environment, generating the "meso-environment", is derived from the response of his expanded cognitive, psychological capacities. Man's cultural response to the natural (physical) environment occurs fundamentally in two forms: exploitation and relocation. Each form of adaptation is a complex, multicausal, and therefore dialectical process, limited in any society by the current state of its culture.

Environmental dimensions--structural elements, complexity of space, and degree of flexibility--must be incorporated into the design process, as they reflect the dialectical nature of life activity and ecological relations: The degree of flexibility in an environment is the level of controllability and changeability that it offers to its users. This flexibility, is complementary to the individual's motivation for competence, and is therefore an essential factor affecting the coping process. The internal ecological process, an individual's filtering and appraisal of the environmental input, is shown to depend upon both structure and the dynamic exchange process between man and environment. Recognition of the linkage between the cognitive process of appraisal and the structure of a situation allows for an environmental adequacy, in which human needs are emphasized in the design elements.

## PREFACE

Among the many ambitions of Modern Architecture an attempt was made to free structure from unnecessary ornamentation; it was an attempt emphasizing convenience rather than architectural elegance. An honest effort was made to exclude any superfluous elaborations, to establish a more harmonious and compatible link with nature, and to eliminate the corrupting influences of conscious endeavors to create a man-made environment. Embellishment, in its decorative sense, has been eliminated to a great extent. However, personalized and biased characteristics of professionally generated architecture have been transformed into other modes of expression--monumentality and technological absurdity. Although monumental architecture, serving a privileged minority, has existed since architecture became an institutionalized phenomenon, an emphasis on technological *tour de force* has been a more recent development beginning at the end of the nineteenth century.

The one-to-one correspondence between the architect and the privileged client enabled the architect to express himself, his intellectual bias, and his personal feelings toward a certain life style--all this by formulating and translating his client's needs into *architecture*. It has remained a relationship between a status and prestige seeking client and an architect who desires recognition of his artistic abilities. On the other hand, while the client changed from a private

one to a more collective one, the emphasis of the architect has shifted from one-dimensional aesthetics to narrowly defined anthropomorphic principles, material resources, or appropriate technologies. However, this shift in the architect's emphasis still did not concern itself with design as a process; the architect's position has remained predominantly that of accepting the man-built environment as the end product.

Socio-political, economic and technological changes were some of the major factors which eventually brought about a transformation of this relationship. Along with these changes in society, the architect was compelled to change his perspective as well. He no longer served the privileged client exclusively, but instead had assumed the public as his patron. However, the nature and attributes of the architect-client relationship remained the same. Instead of presenting a straightforward solution to the architectural problem of the man-environment relationship and its resulting artifacts, the architect persisted in offering merely a visual dialogue between designer and sophisticated observer. Consequently, the only apparent change that occurred has been superficially effective; this change never carried with it a real transformation from an abstract into a concrete relationship; nor has it penetrated beneath the surface of the problem to a more critical understanding. These changes did, however, lead the architect into an awareness of functional requirements and the efficient use of man-made sources and their potentials. The new role into which he was thrust manifested itself in the belief that the architect could change the environment, and consequently the social behavior of the people as well.

Housing design, the aspect of architecture suffering the most from this

type of exaggerated professionalism, should not be merely a process of production and consumption where the real users (inhabitants) are ~~watchers~~ from the outside. The existing conditions that lead to alienation must be changed so that the creative and the qualifying aspect of consumption (actual utilization of the house) complements the inherent creativity and responsibility of the design process. To achieve such a relationship, participation of the user is essential in this reciprocal process.

Furthermore, housing design is not just a process accomodating a utilitarian and functional role, but a building process and an activity accomodating the goal of a "social condenser," making it possible for the inhabitants to practice their control over the environment according to their changing needs. Satisfaction of user needs and an enjoyment in consideration of the environment implies more than a narrowly defined individual level of gratification within the limits of the inhabitant's experiential spontaneity. Environmental adequacy providing the level of enjoyment needed, is attainable only when gratification of a need is interrelated with all the other environmental needs and controls which are the actions of enjoyment themselves. This enjoyment is the individual's comprehension of the environmental adequacy that allows choice and control of the environmental elements. Environmental adequacy is that quality of an environment where form and structural elements are an expression of both the use and the user of the environment and not an *a priori* symbol nor a mechanistic outgrowth of mere function. Although Vitruvius' traditional principles of good architecture - namely, *utilitas*,

*firmitas, venustas* - still hold true, nothing much has been added to these essential constituents in spite of growing knowledge, changing needs and conditions, and the changing client-architect relationship. Design and construction experiences of the past few decades have proven over and over again: that functionalism is more than glorification of the advancing technology; that man is more than a biological entity; and that art is more than an esoteric expression of the artist.

It is not the level of technological capability and scientific consciousness that fails to achieve an environment adequate for the inhabitants' use. It is basically the lack of a realistic understanding of the underlying problem that fails to nourish an adequate man-environment relationship. The house is something more than an aggregation of structural elements accomodating congeries of individuals in their needs and providing for their social conveniences. The house environment is involved in all the household processes of the inhabitants; it is, in fact, part of the process, by being the setting for the actions performed; it is a support system for the individual's coping processes in everyday life; it is a state of mind as well as a physical entity, that extends the range of cognitive abilities through environmental means. Therefore, a realistic understanding of the housing problem must take into consideration of a broader ecological view than the limited, short-sighted definition of the man-environment relationship.

If the designer were to talk about man and his behavior without some ecological awareness he would be working in a vacuum. Since this awareness is determined not only by the physical aspects of the man-



environment relationship but also by social and psychological ramifications, the designer's comprehension of the man-environment relationship must go beyond sensory experience and must involve an understanding of operations of a nature distinctly other than mere reasoning. In other words, the design process must involve an understanding (*intellectus*) beyond reasoning (*ratio*). Only by this merging of the sensory and intellectual knowledge can the design process distinguish itself from a mechanistic and utopic mode of thinking. By defining the design process not as the adoption of a series of goals through reasoning and volition, but as a simple extension of a *praxis* (here: practical activity exercising a direct impact on socio-psychological realms of life), which is part of the objective reality of human behavior, can the design process serve as a tool to bring under control the irrational and destructive aspects of man's desires with regard to environmental issues. By aiming the design process not at the creation of "beautiful" artifacts nor at the pursuit of the designer's personal aims (which eventually became exposed as self-ruinous egoism and frivolity), but to the critical and central issues of housing and society, can the design process accommodate convenience and directness rather than architectural elegance and sophisticated craftsmanship.

It is true that any exaggeration of a conception of knowledge, no matter how objective it may be, in the absence of practice can lead to an over-extension of mere contemplation and abstract thinking. On the other hand, it is equally important to keep in mind that an over-extension of practice in the absence of a theoretical understanding can deviate from the true nature of the problem, possibly confusing the

means and the end. For any theory to serve practice in the most effective manner, it must, in the first place, depend on practice, on human actuality. Reasoning and understanding, practice and theory may be qualitatively different; yet they are not polar opposites nor are they totally divorced from each other; rather they are unified on the basis of human actuality. Within this actuality the design process must set for itself as a primary task the inhabitants' objectification of design elements and the satisfaction of human material needs and wants. The central motif here is the interpretation of man's cognitive processes which are far beyond an act of individuality or will, or an arbitrary convention; they are the reflections developed from man's material needs as they are manifested in his social life. Since man's cognitive processes cannot help but be affected by his physical surroundings and material needs, and since the cognitive faculties together with the material potentialities affect his everyday encounter with environmental demands, the process of cognition and its role in the man-environment relationship must be included in a comprehensive view of an entire objective process. The significance of actuality in cognitive processes and in return the importance of cognitive faculties in actual behavior and action are essential issues of the man-environment relationship since this dialectical process guides a good portion of man's actions. The importance of the physical surrounding (particularly the housing environment), in this dialectical process, lies in the fact that environment has an irreducible impact and influence on actuality and the cognitive processes and also it goes through a change by the combined actions of both. Therefore, the housing environment is an intervening variable in the general behavior and action model.

It appears that the designer, in some compulsive manner, self-consciously tends to intervene in the decision making on behalf of the people for whom he is designing. Any novelty which is introduced into architecture by any means or method, tends to exclude some important aspects of the *whole*. While tools of the framework in which to operate are greatly emphasized, true perception and knowledge of the man-environment relationship seems to be lacking from the design process and concomitantly from its products. Concentrating on only one or a few of the aspects of a total phenomena, and the sort of conceptual simplicity that this brings about, has been an escapist but common activity for architects and administrators involved. The consequences of this have been partial solutions which still retain *monumental* characteristics. These do not satisfy the true needs of man nor do they establish any harmony and concordance between nature-man and man-man within a comprehensive view of concrete ecological relationships.

The solution of the housing problem cannot be a basis for solving social and historical problems in terms of the transformation of social relations. Nevertheless, housing plays an important and a significant part not only in the everyday life of an individual but in the overall view of social and psychological relations (in spite of its limited nature). It is within the housing environment--at least partially--that the social sentiments, moods, attitudes, concepts, emotions and prejudices, illusions, and traditions are molded on the basis of an individual's everyday experiences and personal observations. Housing situations, as a whole--in all their historical stages--develop

on the basis of physical environmental forces and the socio-economic conditions. They are the ramifications of all the forces involved. And in this respect, they are not independent of the history of social development nor are they negligible in the development itself.

An individual can relate to an environment in a human way only when the environment is related to man in a humane way. What, then, is the nature of the man-environment relationship? What are the factors, with respect to environmental qualities, that are involved in an adequate relationship? How does the housing environment influence this relationship? What are the environmental qualities that man can use in his daily coping processes? How are the spatial properties of human behavior affected by the surrounding environment? These questions must be addressed by the designer before any design provision is made to accommodate a broader scope of objectives rather than ill-defined goals. The purpose of the conceptual understanding of human behavior and the environment is to detect the uniformities and universals that exist within the scope of a dialectical relationship. When these objective uniformities in the development of social relationships are traced in the light of the discovery of the roots of their interconnections, in the degree of development of material needs and production, the designer can set true design objectives. These uniformities and these aspects which are not clearly enough defined to be translated into design language, constitute the tacit imperatives of not only physical material needs but also taste, conscience and even the most absurd idiosyncracies. Only when the totality of these imperatives finds its way into the design process and when the individual has choice and

control over his environment can this adequate relationship between man and his immediate environment--housing--be achieved. It is not merely sufficient to provide the most effectively responding environment; it is also necessary to provide an autonomous control over the environment. This autonomy is essential, for individuals are inclined towards adaptations in accomodating to any environmental deficiency; therefore, the environment must be subject to adjustment. This implies an imperative property for the environment, namely that of flexibility.

Not all the questions raised above do necessarily find practical answers in this study. Design ramifications of such matters are very complex due to their interdependence on existing conditions--socio-political, historical, and economical. Answers to some of the issues related to design and practice which are raised above are given daily; the basis for these practical solutions lies in exigencies, immediate needs, availability of resources, in short, primarily in practical considerations. No architectural theory or practice is capable of changing the course of practical politics, which is a strong decisive factor for practical design solutions as well as being a dominant factor in other aspects of everyday life. Therefore, the objectives in this study have been directed towards the understanding of the nature of the man-environment relationship rather than in searching for instant solutions to problems emerging from the complexities involved. It is important to realize that no housing study, thereby no housing design, can avoid confronting such basic and critical issues as the nature of both human behavior and the immediate environment--housing. The attempt has not gone beyond the reconsideration of the man-environment

interaction from a broad ecological perspective. Little emphasis has been placed on the practical aspects, not that they are unimportant but for the reason that most of present day design considerations and their applications suffer from a lack of theoretical understanding of the true nature of man-environment interactions. The shallow or non-existent treatment of theoretical aspects leads to inadequate measures providing substandard environments through architectural acrobatics, or by means of a mechanistic interpretation of the critical urgency for housing and of the true nature of human needs.

In this study we are concerned primarily with the theoretical aspects of the questions posed above, that is, with the understanding of different intervening processes involved with respect to the immediate environment. Chapter One (Reasons for Concern) is essentially concerned with the alienation phenomenon within the realm of the housing environment; meaning-value-need has been recognized as a dialectical relationship and within the light of this relationship a concept of environmental adequacy has been developed. In an effort to link the different but related disciplines of knowledge that are part of the design process, the concept of stress has been introduced. A brief survey of the use of stress as a unit to combine the different components of a broader ecological relationship is given in Chapter Two (Stress as a Unit). Different environments--thermal, atmospheric and olfactory, sonic, and luminous--have been investigated in Chapter Three (Environmental Considerations) with respect to their physiological and psychological influences on man's behavior. Cognitive processes that are involved, especially in psychological

factors due to environmental cues and stimulations, give an understanding of the coping processes with regard to environmental demands. Further affirmation of the importance of cognitive faculties in response to environmental forces (particularly to natural/physical) has been traced through historical and cultural development. Delineation of environmental dimensions--structural elements, complexity of space, and degree of flexibility--has been made to show the dialectical nature of ecological relationships; the structure of environment and the exchange processes between the individual and the environment have been the basic frame of reference by which we have elaborated on these concepts. A theoretical model of environmental stress has been constructed and the concept of environmental flexibility has been developed. Environmental dimensions and the conceptual model of environmental stress are the main issues dealt with in Chapter Four (A Concept of Environmental Stress). In Chapter Five (Implications on the Housing-Design Process), with the aid of a Hegelian-Marxian concept, *praxis*, the housing activity has been defined as a process rather than a product. In the light of the arguments presented in the previous chapters the primary conflicts that exist between the individual's cognitive processes and the environment are discussed; a proposal to divide the design requirements in housing has been made. Following these arguments a hierarchy of design considerations has been suggested.

Any study intended as a preliminary synthesis of any aspect of our knowledge is inevitably indebted to the works of many other people; this study is no exception. Indeed the present study would have been

impossible had I not been able to draw on the works of a multitude of specialists in different fields of knowledge.

I have been privileged to prepare this study under the supervision of Professor James M. Fitch. His encouragement, insight, criticism and tolerance have been invaluable factors in his guidance. I esteem this relationship with affection. For some of the critical concepts that I became aware of in the seminars at the City University of New York, I am grateful to Professor Harold M. Proshansky. Professor Robert G. Anderson's encouragement and support in difficult times during my own study and teaching at the College of Architecture at the University of North Carolina at Charlotte have been of invaluable help. I thank Drs. Joseph M. Lubart and Constantinos Xanthopoulos with appreciation for reading the first manuscript in whole and their helpful annotations. To Dr. Susan Cernyak and Miss Virginia Kerr of UNCC it is more than gratitude I owe for their editorial assistance and encouragement. This study has profited from the diligence and sympathetic commitment of Mrs. Myra Haas, whose assistance went well beyond her typing work. The generosity of my wife Michele in offering support, understanding and tolerance could never adequately be acknowledged. Needless to say I am responsible for what follows.

M. T.

January 1974



TABLE OF CONTENTS

PREFACE. . . . .	1
Chapter One: INTRODUCTION. . . . .	1
REASONS FOR CONCERN	
<i>Alienation</i>	
<i>Meaning-Value-Need</i>	
<i>Summary</i>	
Chapter Two: STRESS AS A UNIT. . . . .	46
<i>Summary</i>	
Chapter Three: ENVIRONMENTAL CONSIDERATIONS. . . . .	61
ENVIRONMENTAL INFLUENCES	
<i>Thermal Environment</i>	
<i>Atmospheric and Olfactory Environment</i>	
<i>Sonic Environment</i>	
<i>Luminous Environment</i>	
RESPONSES TO NATURE	
<i>Exploitation</i>	
<i>Relocation</i>	
<i>Summary</i>	
Chapter Four: A CONCEPT OF ENVIRONMENTAL STRESS. . . . .	132
ENVIRONMENTAL DIMENSIONS	
<i>Structural Dimensions</i>	
<i>Complexity of Space</i>	
<i>Degree of Flexibility</i>	
A CONCEPT OF ENVIRONMENTAL STRESS	
<i>A Conceptual Model of Environmental Stress</i>	
<i>Environmental Flexibility</i>	
<i>Summary</i>	
<i>Propositions</i>	
Chapter Five: IMPLICATIONS ON THE HOUSING-DESIGN PROCESS . . . . .	184
<i>Proposal</i>	
APPENDIX A: PHYSICAL STRESS MODEL. . . . .	206
APPENDIX B: ENVIRONMENTAL FLEXIBILITY IN SQUATTER HOUSING. . . . .	212
SELECTED BIBLIOGRAPHY. . . . .	227

## LIST OF ILLUSTRATIONS

Figure		Page
1.1	General Behavior Model . . . . .	39
3.1	Stable Limit Cycle . . . . .	64
3.2	Stable Trajectory. . . . .	65
4.1	Psychological System - Internal Ecological Process . . . . .	168
4.2	Stress - Strain Model. . . . .	169
A-1	Stress - Strain Curve. . . . .	209

## Chapter One

### INTRODUCTION

#### REASONS FOR CONCERN

The end result of design is the objectification of the total design process. Under certain conditions this objectified and reified human activity can lead to the domination of man by his own products.<sup>1</sup> Objectification denotes the act of personalization of the objects by the individual. Objective reality in an environment realizes man's

---

<sup>1</sup> The phenomenon of objectification became one of the fundamental elements in Karl Marx's preoccupation with the threats and promises of a new age. As a key element in the concept of alienation which Marx treats in the *Economic and Philosophical Manuscripts of 1844*, objectification is an integral part of the substance of his thought about man's nature. His economic philosophy, which stems from these key concepts within a socio-historical perspective, is a search for solutions to the problems confronting the individual and his relationship to the whole environment—a rapidly changing, industrializing and urbanizing society. See: K. Marx, *Karl Marx: Early Writings*, trans. and ed. T.B. Bottomore, New York: McGraw-Hill Book Co., 1963 (esp. Alienated Labour, last section of the First Manuscript, pp. 120-134). For Marx man's activity of production and labor which leads to concrete externalization of his powers is the essential criterion for objectification: "The product of labour is labour which has been embodied in an object and turned into a physical thing; this product is an *objectification* of labour. The performance of work is at the same time its objectification. The performance of work appears in the sphere of political economy as a *vitiation* of the worker, objectification as *loss* and as *servitude to the object*, and appropriation as *alienation*." (p. 122). Later in the Manuscript he delineates on this further: "It is just in his work upon the objective world that man really proves himself as *species-being*. This production is his active species-life. By means of it nature appears as his work and his reality. The object of labour is, therefore, the *objectification of man's species-life*; for he no longer reproduces himself merely intellectually, as in consciousness, but actively and in a real sense, and he sees his own reflection in a world which he has constructed." (p. 128).

own faculties when all objects become the objectification of the individual himself. In other words, the objects have to confirm and realize personal individuality by defining the conditions for material existence; objectification is the premise and the condition for human material existence; it is the creation and control of environmental elements, thereby leading to unfold potentialities and faculties (cognitive and physical) of man. It should be emphasized, however, that this is not merely an intellectual phenomenon<sup>1</sup>; the autonomous existence of environmental elements requires a control over them, beyond the merely cognitive processes, to overcome the independent existence of these elements.

When the designed elements (products) in man's environment acquire an existence independent of him, autonomous in their functioning, then man himself becomes a subordinate to these "things". This phenomenon, known as *alienation*, (a Hegelian-Marxian concept), creates an unhealthy

---

<sup>1</sup>For a further discussion of Hegel's and Marx's explanation of objectification with regard to this matter, see: S. Avineri, *The Social and Political Thought of Karl Marx*, Cambridge, England: Cambridge University Press, 1968, pp. 96-105; R. J. Bernstein, *Praxis and Action*, Philadelphia: University of Pennsylvania Press, 1971, pp. 42-50; and also I. Meszaros, *Marx's Theory of Alienation*, New York: Harper and Row Publishers, 1970, pp. 61-65. Briefly, the major distinction between Hegel's and Marx's interpretation of objectification lies in the positions that each thinker takes: for Hegel, spirit is the object-creating force and objectification is defined as the creative activity of nature and the successive cultures; for Marx, objects that man produces are the concrete externalization of his powers and faculties, and it is this labor power and control that defines the objectification. Marx criticizes the purely spiritual approach to the real problem of the creation of objective conditions: "...to rise it is not enough to do so in thought and to leave hanging over our *real sensual* head the *real-palpable* yoke that cannot be substituted away with ideas. Yet *Absolute Criticism* has learnt from Hegel's *Phenomenology* at least the art of changing *real objective* chains that exist *outside me* into *mere ideal*, *mere subjective* chains existing *in me*, and thus to change all *exterior palpable* struggles into pure struggles of thought." K. Marx and F. Engels, *The Holy Family*, trans. R. Dixon, Moscow: Foreign Languages Pub., 1956, p. 15.

relationship between the individual and his environment in the course of his daily activity. His inability to cope consciously with the spontaneous demands of his own products and his subjection to a real situation not under his control, tend to make the individual a captive of his own environment. In the long run, such an antagonistic relationship, due to the diverted objectification of human activity as a result of the design process, may lead to "delayed pathological effects"<sup>1</sup> in man.

The individual's consciousness of his housing environment, does not spring from the abstract sphere of pure thinking but from the concrete circumstances of the environment's physical conditions and social relations. However, this consciousness is not a mechanical act, but a complex dialectical process.<sup>2</sup> This process, as in Freud's theory of motivation and conflict (dual-instinct theory), assumes that two opposing forces with contrary purposes or directions exist together.<sup>3</sup> The conflict lies between the demands made by the external environment and those of the inner self of the individual. Furthermore, the inner

---

<sup>1</sup>R. Dubos, *So Human An Animal*, New York: Charles Scribner's Sons, 1968, p. 148.

<sup>2</sup>The dialectical process signifies that properties of human reason are not *a priori*, and that the general trend of the *process of becoming* can only be influenced by concrete situations. The process that leads to consciousness is the process of reality (concrete situations); this consciousness leads to a certain kind of action and behavior in that particular setting; this action or behavior tends to change the undesirable actual situations; and this change brought about by the action gives rise to new consciousness:

<sup>3</sup>For more detailed discussion of S. Freud's "dual-instinct theory" and its relevance to the dialectical process, see his: *New Introductory Lectures on Psychoanalysis*, trans. J. Strachey, New York: W.W. Norton and Co., 1965, (1933), pp. 95-111; and *Civilisation and Its Discontents*, trans. J. Strachey, New York: W.W. Norton and Co., 1962, (1930), pp.

4  
self may be in conflict with opposing tendencies which may lead to the possibility of different responses to the external environmental demands.

According to Marx and Engels this consciousness can be nothing else but conscious existence, the actual life process.<sup>1</sup> During the life process, interwoven with material activity, the individual's conceiving, thinking and coping processes develop. The elements of this consciousness are "...at first, of course, merely consciousness concerning the immediate sensuous environment and consciousness of the limited connection with other persons and things outside the individual..."<sup>2</sup>

Although sensation is animal in origin, it is developed beyond the mere sensory response in human beings to set the basis for human behavior and action. In very broad terms, the assumptions in man-environment relationship studies tend to be twofold. First, with the help of ethology, some results of studies made on animals are projected towards man's interaction with the environment; second, a symbolic meaning, which is a direct result of man's cultural values, is emphasized in the interpretation of the man-environment relationship.

The biggest difference between man and animal lies in the nature of this consciousness which is in fact a social product. For the

---

55-69. However, it must be kept in mind that Freud took a critical view of Marxism, particularly of the dialectical process (See *New Introductory Lectures...*, pp. 176-181). This criticism is basically directed toward the materialistic (mainly economic) aspects of the dialectical process and fails to see in a broader perspective its conceptual relevance to the very same phenomenon (coexistence of opposing purposes—their struggle and unity) that he, himself, argues with regard to motivation and conflict.

<sup>1</sup>K. Marx and F. Engels, Feuerbach: Opposition of the Materialistic and Idealistic Outlook, in *Selected Works*, 3 Vols.; Moscow: Progress Publishers, 1969, v.1, p. 25.

<sup>2</sup>*Ibid.*, p. 32.

animal there is no distinction between itself and life activity, whereas, for man, this life activity itself is an object of his consciousness.<sup>1</sup> Certainly, this conscious life activity is different from the life activity of animals. Although reality strongly proves this to be the case, some studies of human behavior, and habitat as well as their proposed methodologies fail to see this basic distinction between man and animal.<sup>2</sup> The implications of such limited approaches in the design process result in the idea that man behaves like a mechanism. It is assumed that man does not require more than the satisfaction of his immediate physical needs.

The adaptation of animals to their environment is of a passive nature; man on the other hand, actively changes his environment. These changes are implemented with the aid of his physical labor and his mind. At their highest level of development, animals are capable of merely "collecting" the means of subsistence, whereas man produces them."<sup>3</sup> Evidently, man has a different relationship with the environment than the animal. This difference alone should make the attempts to apply the

<sup>1</sup>Marx, Karl Marx: *Early Writings*, p. 127.

<sup>2</sup>Some of the most influential studies in the area of ethology and its relationships to man's environment have been done by J.B. Calhoun. For example, see: Population Density and Social Pathology, *Scientific American*, v. 206, n. 2, 1962, pp. 139-148; Design for Mammalian Living, *Architectural Association Quarterly*, v.1, n.3, 1969, pp. 24-35. See also: B.B. Greenbie An Ethological Approach to Community Design, in W.F.E. Preiser (ed.), *Environmental Design Research*, (Selected Papers, 4th International EDRA Conference), 2 Vols.; Stroudsburg, Penn.: Dowden Hutchinson and Ross, Inc., 1973, v.1. pp. 14-23; and A.H. Esser Ethological Contributions to Understanding the Human Use of Space, *Man-Environment Systems*, v.2., n.2, 1972, pp. 105-108.

<sup>3</sup>G. Glezerman, "Historical Materialism As a Science, in G. Glezerman and G. Kursanov (ed.s), *Historical Materialism: Basic Problems*, trans. D. Fidlon, Moscow: Progress Publishers, 1968, p. 33.

findings from animal studies to that of the human habitat appear unacceptable.

At times the manifestation of man's consciousness is carried to opposite extremes. This happens when the environment is treated primarily as a symbolic extension of man's activities.<sup>1</sup> This fetishistic characterization of man's environment tends to ignore the material activity of man. Just as religion is primarily a product of mankind's lack of control over the natural and societal forces,<sup>2</sup> so similarly do the mystical and metaphysical forces, manifest in some sort of symbolism, become the products of the individual's inability to control his own immediate environment.

#### *Alienation*

Through the three interchangeable concepts posed by Marx<sup>3</sup>--*alienation*, *objectification* and *fetishism*--we can have a better insight into the misconceived assumptions and premises which eventually affect the man-environment relationship. The concept of alienation extends beyond the oppressed classes of society, i.e. it is not purely economic in

---

<sup>1</sup>See, e.g.: C. Cooper, *The House As a Symbol of Self*, Working Paper No. 120, Institute of Urban and Regional Development, The University of California, Berkeley, May 1971; and also, Lord Raglan, *The Temple and the House*, London: Routledge Kegan Paul, 1964. Lord Raglan goes even further to argue that houses were neither shelters nor dwellings but temples and that the house form is derived from the form of the temple.

<sup>2</sup>G. Novack, *The Problem of Alienation*, in E. Mandel and G. Novack *The Marxist Theory of Alienation*, New York: Pathfinder Press, Inc. (A Merit Pamphlet), 1970, pp. 38-39.

<sup>3</sup>Marx, *Karl-Marx: Early Writings*; See also, K. Marx, *Capital*, 3 Vols.; trans. S. Moore and E. Aveling, New York: International Publishers, 1967, (esp. v.1, pp. 71-83; v.3, pp. 391-399):



character. It is a social and psychological expression of the fact that the individual lacks effectual control over the forces in his environment and has not yet obtained control over the basic sources of his daily activity. The alienation of the inhabitant in relation to his environment does not only mean that his environment becomes merely an object, but that the environment assumes an independent existence. The environment exists independently of the individual, alien to him, and functions adversely as a dominating power.

The alien nature of the environment forces either passive acceptance or revolt upon the individual, which is contrary to the process of consciousness. The process of consciousness, as it is related to the housing environment, is not a passive act on the part of the individual. Since it is the actual reflection of the existing housing situation in which the individual's experience takes place, it has a dialectical nature and this invariably acquires an active character. The process of consciousness is nothing other than an individual's life activity.

In a broader perspective, the phenomenon of alienation can be viewed as a process rather than a set of variants. Barakat, in an attempt to approach the problem analytically, describes three stages in this process: a) sources of alienation; b) alienation as a mode of experience; and c) behavioral consequences of alienation.<sup>1</sup> There are both multi-directional and interactional relationships between these stages. Following this analytical approach, we shall describe each

---

<sup>1</sup>H. Barakat, *Alienation: A Process of Encounter between Utopia and Reality*, *The British Journal of Sociology*, v.20, n.1, 1969, pp. 1-10.

stage in this process within the context of the man-environment relationship.

#### Sources of Alienation

The sources of alienation consist of two major classes: 1) states of overcontrol; and 2) states of undercontrol.

i. *States of overcontrol* refer to *highly inflexible environments* or *oversimplified environments*<sup>1</sup> and can be described as the following set of circumstances: a definite lack of opportunities for the inhabitants to control, manipulate and influence the elements of the environment which act upon their daily activities will probably eventuate feelings of alienation. This state of powerlessness is primarily due to the hindrance of real participation in the creation and objectification of the environment by the inhabitants.

ii. Another aspect of the state of powerlessness is the problem of *identity*. This is mainly a lack of direct communication between the designer and the inhabitant. The "alienation of the capacity to communicate" as Mandel<sup>2</sup> calls it, is partially a result of the fact that the architect deals not with the actual tenant as decision maker but with the legal client. The new type of relationship wherein the personal patronage of the past has diminished, is a dilemma which "impels architects to emphasize their social engineering claims in

---

<sup>1</sup>C. Perin refers to such environments as *captive environments*--a "variant of the structured, directive, and authoritarian environment." *With Man in Mind*, Cambridge, Mass.: MIT Press, 1970, p. 43.

<sup>2</sup>E. Mandel, *The Marxist Theory of Alienation*, in E. Mandel and G. Novack *The Marxist Theory of Alienation*, New York: Pathfinder Press, Inc. (A Merit Pamphlet), 1970, p. 23.

attempts to counter the imbalance between their ideal self-image and the actual situation."<sup>1</sup> The designer is separated from those for whom he is designing both socially and administratively.

Housing situations and policies which lead to such feelings of alienation are various and numerous. What the official housing policy makers and other related agencies try to provide is often diametrically opposed to the hierarchical order of things that the families seek. This is especially true for housing developments in underdeveloped countries where there is the pressing problem of squatter settlements. Although the dilemma of squatter settlements is more a social than an urbanistic problem, the solutions that are proposed derive from a narrow perspective of merely providing shelter.<sup>2</sup> For instance, Turner's extensive studies in Latin America show that the low income families of the squatter settlements seek secure land tenure, community facilities, adequate dwellings and utilities in this order.<sup>3</sup> Yet, what the state offers them is exactly the opposite in order of priority. Similar conflicting situations, which become sources of alienation, exist in many other developing countries.<sup>4</sup>

1A. Lipman, *The Architectural Belief System and Social Behavior*, *The British Journal of Sociology*, v. 20, n.2, 1969, pp. 190-204.

2I. Tekeli, *Gecekonduhari Planlama Sorunlari Ve Yollari* (Planning Problems of "Squatters"), *ODTU Gelisme Dergisi*, Ankara, n.2, 1971, pp. 285-314.

3J. C. Turner, *Barriers and Channels for Housing Development in Modernizing Countries*, *AIP Journ.*, v.33, n.3, 1967, pp. 167-181; J.C. Turner, *Lima's Barriadas and Corralones: Suburbs versus Slums*, *Ekistics*, v.19, n.112, 1965, pp. 152-155.

4P.A. Emery, *Creative Aspects of Shanty Towns*, *Ekistics*, v.15, n.90, 1963, pp. 268-271.

The uncounscious imposition of middle-class values upon the design of housing for the lower and working classes is not unique to the developing countries alone. The hindrance of participation in the actualization of their new environment lead to feelings of alienation among Boston's West End residents when they had to relocate.<sup>1</sup> Nor is it only true for low-income housing. Reynold's and Nicholson's survey of the attitudes and general satisfaction of housewives living in high-rise residential blocks in London and in Sheffield, shows evidence of feelings of alienation due to too much enclosure and the tenants' inability to control their immediate environment.<sup>2</sup> Gottman views these phenomena of dissatisfaction and alienation as resulting from denial of free choice.<sup>3</sup>

The designer's social and administrative policy, as distinct and removed as it is from those for whom he designs, is partially responsible for the shallow treatment of the housing problem. Efforts to solve this situation generally do not go beyond relating housing design to housing values.<sup>4</sup> The crucial relationship, however, lies between the residents' total set of values and the whole socio-housing environment. Household tensions, the conflicting assessments of the different aspects of the

<sup>1</sup>C. W. Hartman, The Limitations of Public Housing-Relocation Choices in a Working-Class Community, *AIP Journ.*, v.29, n.4, 1964, pp. 283-296.

<sup>2</sup>I. Reynolds and C. Nicholson, Living Off the Ground, *Architects' Journ.*, v.150, 1969, pp. 459-470.

<sup>3</sup>J. Gottman, The Ethics of Living at High Densities, *Ekistics*, v.21, n.123, 1966, pp. 141-145.

<sup>4</sup>J. P. Dean, Housing Design and Family Values, in W.L.C. Wheaton, G. Milgram, and M. E. Meyerson (ed.s), *Urban Housing*, New York: The Free Press, 1966, pp. 127-138.

living arrangements, reveal apparent malfunctioning in the everyday life of the dwelling.

iii. The modern idea of *efficiency* as a way of achievement and success is a likely source for the feeling of alienation. Along with technological advances, the utilization of technological potentials increased, and the industrialization of architecture found its place in the architectural process. While technology and its means are an undeniable source of potential, its utilization and implications do not ordinarily go beyond the search for minimum dimensions, assuming that efficiency and economy are the prime goals in the man-environment relationship. Consequently, this mechanically interpersonal relationship helps to bring about the treatment of individuals as numbers or things.

At present many countries feel the weight of the problem generated by the "efficiency approach." Despite the obvious consequences of such a design attitude, extensive studies now going on promote technological efficiency defined in rather narrow terms.<sup>1</sup> The issue is seemingly diverted from the actual goals in favor of the means to fulfill those goals. That is, the means (in this case, technology) are emphasized, optimized and utilized in the most efficient way. Somehow, the designer completely detaches himself from the more critical issues that he ought to be dealing with. This approach hurts the individual since, in the design process, the individual's needs become overshadowed by efficiency of the means. In other words, man is eliminated from

---

<sup>1</sup>R. Severino, *Equipotential Space: Freedom in Architecture*, New York: Praeger Publishers, 1970.

the whole process of design. Material satisfactions do not completely satisfy man's fundamental needs.<sup>1</sup> Under the guise of industrialization or rationalization, the other constituents of the system are ignored for the sake of cheaper and quicker construction.

The complex and many sided relationship between man and his environment tends to be reduced to a mechanical interpersonal relationship.<sup>2</sup> When applied to the design process, this approach results in methods utilizing rapid construction and a narrowly defined economy as the determining factors. The results are socially and psychologically

<sup>1</sup>J. Spencer, et al., *Stress and Release in an Urban Estate*, London: Tavistock Publications, 1964.

<sup>2</sup>Design consequences of this tendency can be seen in, for example: V.S. D'Souza, *Social Structure of a Planned City-Chandigarh*, New Delhi: Orient Longmans Ltd., 1968. This tendency seems to be very common among many researchers. A.L. Schorr, for example, speaks about housing conditions and their effect upon social mobility. According to him, architectural, political and social decisions about housing, "...no matter how remote, it may seem at first thought, affects the ability of poor people to move up out of poverty." *Slums and Social Insecurity*, Washington, D.C.: U.S. Government Printing Office, 1966, p. 3. Later on, Schorr concludes that housing plays a role in the "prevention of poverty," (p. 96). Recently, in his book *Defensible Space: Crime Prevention in Urban Design*, New York: The MacMillan Co., 1972, O. Newman described defensible space as a "...living residential environment which can be employed by inhabitants for the enhancement of their lives, while providing for their families, neighbors, and friends," p. 3, and expressed his research findings, observations and general guidelines that emerged from these studies. In spite of some valuable information pertaining to human behavior and the environment, the book regards, with a simplistic attitude, the man-environment relationship: "...defensible space design also attempts to attack the root causes of crime." (p. 4; italics added). It is evident that the man-environment relationship cannot be reduced to a set of conditions which represent the sole causes for certain behaviors, in this case criminal, and which derive from outside of the psychological construct, a function of personality structure and socio-economic conditions. Whatever the effects of the surrounding environment and peripheral stimulation, the drives or needs leading to criminal actions involve psychological and social reasons, as well as economic conditions. The dialectical complexity, that is inherent in the man-environment relationship, forces us to be concerned with broad categories of change rather than with real causes as is done in the physical sciences.

stifling, visually monotonous buildings which lack capacity to be adapted to the needs of present day man. Instances of this type have been occurring in capitalist<sup>1</sup> and socialist<sup>2</sup> countries alike. Large project dwellings have been dismantled long before the expected life span of the buildings has been reached. Similar dissatisfactions and complaints are heard from tenants residing in project dwellings in Pedregulhos, Budapest,<sup>3</sup> Halle-Neustadt,<sup>4</sup> and in Ankara.<sup>5</sup>

iv. An oversimplified view of human behavior and a crude standardization in the architectural elements eventually demand conformity from the residents beyond their capacities. Such an interpretation of the needs of the individual is another potential source of alienation. This absurd uniformity, providing little variation and challenge in the living environment of the inhabitants, stems from the fact that everyone is expected to fit into the mold of an instant environment rather than to live in it across time. Shad Woods observed this phenomenon as desolation: "Cells have been stacked, staggered or spread out in an endless variation of geometrical arrangement to make an endless series

<sup>1</sup>The New York Times, October 29, 1970, p. 47; The New York Times, June 10, 1973, section 2, p. 24.

<sup>2</sup>D. Khazanov, Standard Architecture or Architectural Standard, *Arkhitektura SSSR*, n.9, September 1970, pp. 30-33.

<sup>3</sup>B.C. Brolin and J. Zeisel, Social Research and Design: Applications to Mass Housing, in G.T. Moore (ed.), *Emerging Methods in Environmental Design and Planning*, Cambridge, Mass.: MIT Press, 1970, pp. 239-246.

<sup>4</sup>The New York Times, February 25, 1973, p.6.

<sup>5</sup>I. Acaroglu, "Gecekondu Alanlari Yer Secimi Kriterleri ve Onleme Yaklasimlari" (Criteria for the Selection of Locations for Squatter Housing), Project Report, YAE. PR.22, Middle East Technical University, Ankara, June 1972, (Mimeographed).

of virtually identical housing schemes, from Stockholm to Algiers, and from Moscow to London...The result is desolation. Nothing so resembles a *plan masse* as another *plan masse*."<sup>1</sup> This rather dismal view is based on the products of the contemporary architect's professional belief system which assumes that the social behavior of the inhabitants is influenced by the physical environment, they are simply molded by it.<sup>2</sup> Further; it is a rather common assumption among architects and planners that the built environment, prescribed by the designers, can bring solutions to most of the problems facing society. This mania for grandiose performance is based upon the infantile interpretation of the "master builder's historic role".<sup>3</sup>

The weakness of such a theory lies in the fact that *there is a difference between the intended and the actual utilization of a space*. This is evidently due to unanticipated demands of the inhabitants and the crude interpretations of whatever needs are considered at the design

<sup>1</sup>A. Smithson (ed.), *Team 10 Primer*, Cambridge, Mass.: MIT Press, 1968, p. 90.

<sup>2</sup>There are numerous criticisms written about the architect's professional belief system. Some of these stress the urgency for a new role definition to clarify the architect's position in the trinal relationship of artist-technologist-and social engineer. See, for example: M. Broady, *Social Theory in Architectural Design, Arena*, January 1966, pp. 149-154; also Lipman, *The Architectural Belief System and Social Behavior*.

<sup>3</sup>In *A Report on Your Profession, AIA Journ.*, v.33, n.6, 1960, pp. 115-130, the AIA Committee on the Profession expressed their concept of the architect's role in the following manner: "The total environment produced by architecture in the next forty years can become greater than the Golden Age of Greece, surpass the glory of Rome, and outshine the magnificence of the Renaissance. Such an era is possible, provided the architect assumes again his historic role as the master builder. In such a role he must retain the basic control of design, not only of individual buildings but of all design involved with man-made environment.", p. 118.



stage. Obviously the social and psychological costs of this demand for conformity may sometimes be expensive.

Evidence of nonconforming usage of spaces is quite apparent in many studies that attempt to evaluate the attitude of residents toward their environment.<sup>1</sup> For instance, Cooper reports this conflicting situation, especially for the internal layout and design of houses, despite the fact that residents evaluated some other aspects (e.g. immediate external surroundings, choice of materials, social environment) of the design project rather favorably.<sup>2</sup> A lack of flexibility, dormitory characteristics, and a lack of community integration in the new housing developments can be attributed to the fact that everyone is expected to fit into these instant environments.<sup>3</sup> Unsuitability of high-rise residential blocks along the same lines has been the resulting factor of the above mentioned characteristics.<sup>4</sup> Problems of individual adjustments, isolation and security, unfulfilled emotional responses, and social recognition, as well as the individual's being deprived of new experiences are all potential sources for the arousal of alienation. Ward relates this type of alienation to the analytic

---

<sup>1</sup>I. Rosow, *The Social Effects of the Physical Environment*, *AIP Journ.*, v. 27, n. 2, 1961, pp. 127-133.

<sup>2</sup>C. Cooper, *Resident Attitudes Towards the Environment at St. Francis Square, San Francisco: A Summary of Initial Findings*, Working Paper No. 126, Institute of Urban and Regional Development, The University of California, Berkeley, July 1970.

<sup>3</sup>W. V. Hole, *Social Effects of Planned Rehousing*, *Town Planning Review*, v. 30, July 1959, pp. 161-173.

<sup>4</sup>R. Lal, *Living Conditions in Multi-Storeyed Habitations and Their Socio-Psychological Impacts*, Roorkee, India: Nem Chand and Sons, 1969; A. Stevenson, E. Martin and J. O'Neill, *High Living: A Study of Family Life Living in Flats*, Carlton, Victoria: Melbourne University Press, 1967.

techniques that are based on 'absolute', 'atomistic' or 'deterministic' notions.<sup>1</sup> These not only lead to alienation for the residents, but, according to Ward, also lead to difficulty and dishonesty for the designer.

1. *States of undercontrol* refer to *extramural environments*. These are properties of normative structure. The *lack of realism* in the approach to design and its eventual effect upon the individual is a potential source for the feelings of alienation. Different schools of modernism and formalism, especially in the field of visual arts, have influenced the architectural expression. The various forms of "isms"—cubism, expressionism, utilitarianism, futurism, etc.—in general either assume that the human meaning of reality exists in the immediacy of appearances (e.g. utilitarianism), or reflect the reality of man devoid of any meaning (e.g. cubism).<sup>2</sup> The "isms", which are obviously anti-realist and a-social in character, eventually lead to feelings of

---

<sup>1</sup>A. Ward, Rightness and Wrongness In the Physical Environment, in G. Broadbent and A. Ward (ed.s), *Design Methods in Architecture*, New York: George Wittenborn, Inc. (Architectural Association Paper No. 4), 1969, pp. 166-178.

<sup>2</sup>These different movements with regard to different forms of art, e.g. painting or sculpture, are one thing; but when transposed to architecture, they assume a different significance altogether. One particular architectural movement—Constructivism—deserves a special note, here. Constructivism, primarily a Post-Revolutionary architectural movement in the Soviet Union, evolved rapidly together with the other arts to enhance the social development of the new era. The work that was done particularly in the housing area by Constructivists such as M. Barshch, M. Ginzburg, I. Milinis, A.A. Ol, A. Pasternak, I. Sobolev, G. Sum-Shchik, G. Vegman, and V. Vladimirov are significant not only for their effective solutions to incorporate the architectural enclosure into the new way of life but also for their consideration of the multi-dimensional issues involved in the housing problem. Economic and rational design solutions were not detached from social and psychological aspects of the complex problem. Commitment and consciousness of the StroiKom architects took them far beyond a mere

alienation. Their roots lie in subjective and individualistic idealism which quite easily turn into capricious and one-sided ideas, eventually being imposed on the individuals. They lack the "vital links with life and [lack] a profound study of human existence,"<sup>1</sup> as well as continuity.

On the other hand, architectural functionalism (a "rational" movement), which is the architectural counterpart of utilitarianism, showed a deceptively promising impact at the beginning. However, the extension of rationalism (or as Mezaros refers to it as "the growing abstraction from human needs in favour of the needs of the market"<sup>2</sup>) was nothing more than a conceptualization of nature that was completely divorced and alienated from man. This was mainly due to the triviality and shallowness of the concept which only sought those aspects of the

---

response to the needs of the day. "They knew that transformations of morals and entrenched habits could not be promulgated by decree or with the wave of a wand," as A. Kopp expresses their assents and credences in his *Town and Revolution: Soviet Architecture and City Planning 1917-1936*, trans. T.E. Burton, London: Thames and Hudson, 1970, (1967), p. 140. M. Ginzburg's own words express the non-utopic role they had adopted in their approach to the housing problem in prompting a transformation to a new way of life: "We consider that one of the important points that must be taken into account in building new apartments is the dialectics of human development. We can no longer compel the occupants of a particular building to live collectively, as we have attempted to do in the past, generally with negative results. We must provide for the possibility of a gradual, natural transition to communal utilization in a number of different areas... We considered it absolutely necessary to incorporate certain features that would stimulate the transition to a socially superior mode of life, *stimulate but not dictate*." Shlushali: Problemy Tipizatsii Zhil'ya R. S. F. S. R. (Minutes: Standardization Problem of Dwellings in the R.S.F.S.R.), *Sovremennaya Arkhitektura*, n.1, 1929, pp. 4-6, (p. 5), quoted in Kopp, *Town and Revolution*, p. 141. See also the Appendices given in Kopp's book, pp. 245-260.

<sup>1</sup>A. Dymshits, Realism and Modernism, in S. Moshnyagun (ed.), *Problems of Modern Aesthetics*, Moscow: Progress Publishers, 1969, pp. 261-298, (p. 279).

<sup>2</sup>Mezaros, *Marc's Theory of Alienation*, p. 193.

individual that "correspond to the immediacy of private utility and private appropriation."<sup>1</sup> The consequences are a general depletion and impoverishment of daily life along with the encouragement of individual's isolation.

Besides the initial momentum which Modern Architecture gained from the Cubist and Futurist movement at the turn of the century, Banham<sup>2</sup> lists three predisposing causes originating in the nineteenth century which acted as accelerators upon this new architecture: first, the architect's sense of responsibility to the society (Pugin, Ruskin, Morris); second, the Rationalist, or structural approach to architecture (Willis, Viollet-le-Duc, Auguste Choisy, Semper); third, the tradition of academic instruction (Ecole des Beaux-Arts). None of these predisposing causes was strong enough to liberate what existed earlier (architecture of the nobility, monumental architecture) from serving the power elite. Nor could Modern Architecture, any more than its predecessors, despite all the technologies which it had at its disposal, bring comprehensible and sound solutions to the environmental problems of the masses.

Some short lived movements (e.g. Futurism, 1901-1914, De Stijl, 1917-1925, Constructivism, 1911-1932) and some relatively long lived movements (e.g. Bauhaus since 1919) tried to reject the past of monumentality and classicism. Attempts were undertaken to purify and give a new meaning to architecture and to make it equally available to

<sup>1</sup>Meszaros, *Marr's Theory of Alienation*, p. 204.

<sup>2</sup>R. Banham, *Theory and Design In the First Machine Age*, New York: Praeger Publishers, 1960, p. 14.

the masses rather than merely to the privileged. The link between technology and art was established but it could not bridge the contradictions between technology, art and society.<sup>1</sup> Although functionalism achieved some "honesty" in architecture, it is nevertheless "in part, an arbitrary artistic style, whose affinities with Cubism, Mondrian's geometrical abstractionism, sculptural constructivism, rationalistic music and anti-poetical poetry are evident."<sup>2</sup> Any design based upon subjective idealism, individualism, aestheticism or formalism, that is, design isolated from reality, must vanish before a sound solution can be generated.<sup>3</sup>

Furthermore, the industrial revolution, despite all of its potential, created a problem within the system of production and the distribution of wealth. Fitch explains the phenomenon in the following manner:

Industrial civilization, through mass production has made material plenty a reality for mankind for the first time

---

<sup>1</sup>This is very apparent especially in the attempts made by the Bauhaus, which has been one of the most influential schools in the Modern Movement. The failure of integrating technology, art and society was not the result of unconscious or unintentional efforts. Individuals who attempted to search for solutions and methods within the context of social and economic factors were not very encouraged. Furthermore, some of the leading figures in the Bauhaus movement were even persecuted for their beliefs and attempts to bring in the social aspects. Hannes Meyer who was appointed the director of the school (1928-1930) after Walter Gropius, was one of those who was forced out because of his efforts to tie in the social aspects of the environment with the technological and artistic aspects, which were being emphasized by the Bauhaus. See: H.M. Wingler, *The Bauhaus*, trans. W. Jabs and B. Gilbert, Cambridge, Mass: MIT Press, 1969, (1962), (esp. pp. 139-143, 153-154, 163-165).

<sup>2</sup>R. McFullen, *Art, Affluence and Alienation*, New York: Mentor Books, 1969, p. 213.

<sup>3</sup>J. M. Fitch, *Architecture and the Esthetics of Plenty*, New York: Columbia University Press, 1961, p. 279.

in history. It has, by the same process, robbed all of us of first hand knowledge even of how the tools of daily life are made or how they work. It has correspondingly crippled our ability to evaluate critically their practical or esthetic value. It has made the citizen into an ignorant consumer, the designer into an isolated, powerless specialist.<sup>1</sup>

Even well intentioned attempts do not produce more than a certain amount of fantasy and trivial solutions which forever remain as extramural environment. Collins passes this judgment "...among all the conflicting ideals of modern architecture, none has proved today of such importance that it can take precedence over the task of creating a humane environment."<sup>2</sup> A lack of historical focus and detachment from real life situations emerge as the main causes for the failures of all of these movements.

ii. *Isolation of the individual*, which results from the "lack of realism" in the environment, is another source of alienation. The concepts of suburbia and more recently the concepts of "planned environments" (e.g. Columbia, Reston...) are all rather effective in encouraging a gradual disintegration of interpersonal relations.<sup>3</sup> Object-oriented and

<sup>1</sup>Fitch, *Architecture and the Esthetics of Plenty*, p. 269.

<sup>2</sup>p. Collins, *Changing Ideals in Modern Architecture*, London: Faber and Faber, 1965, p. 299.

<sup>3</sup>According to one categorization, "new towns" include "new communities" (over 2500 acres) and "new communities" include "planned residential environments." These categories are also distinguished by their degree of self-sufficiency which decreases with the flow of inclusion. See: J.B. Lansing, R.W. Marans, and R.B. Zehner, *Planned Residential Environments*, Ann Arbor, Michigan: Survey Res. Center, Inst. for Social Res., The University of Michigan, 1970, pp. 3-9. The problem of isolation has long been a dominant issue among those who study the sociology and psychology of the residents living in suburbs and "planned residential environments." For example, H. Gans' studies led him to attribute (at least partially) the phenomenon of isolation to the physical characteristics of the newly built environments. Social

impersonal designs at town level or at the residential level tend to reduce the *social individual*. In other words, an emphasis on the human significance from a historical and social point of view is missing in these approaches to environmental design.

Housing design studies and attitudinal surveys taken in different cultural environments tend to agree with each other in respect to problems of isolation and difficulties in adjusting to some unexpected situations.<sup>1</sup> Complaints of isolation were much higher among those who

isolation, as a result of the inability to get along with neighbors, incompatibility among friends, and not being able to participate in the significant community activities are seen as inevitable consequences of these rather sterile environments. This problem is more predominant among some women and adolescents who search for a social identity and who look for more interpersonal relations within their limited capacities. According to Gans, physical isolation, as a result of being "stuck" in the house and the surrounding community, is more prevalent among women with small children. See his article Planning for the Everyday Life and Problems of Suburban and New Town Residents, in *People and Plans: Essays on Urban Problems and Solutions*, New York: Basic Books, 1968, pp. 183-201, (esp. 184-186). In his other writings these problems are further confirmed by the people who expressed their idea of such environments as "too quiet for their tastes, lonely—that is, without street life—and occupied by people concerned only with trying to appear better than they are." *The Urban Villagers*, New York: The Free Press, 1962, p. 22. Admittedly, such environments may be more suitable for nuclear families than they are for extended families as W. Michelson ascertains in his book, *Man and His Urban Environment: A Sociological Approach*, Reading, Mass.: Addison-Wesley Pub. Co., 1970, p. 79. However, the problem of isolation and interpersonal relations which manifests itself in the *incongruence* between an accustomed life style and such an environment as Michelson points out later is not overcome, (pp. 79-80). Writing about the need of an "intimate contact" to surmount "the autonomy-withdrawal syndrome" prevalent in the urban environments, C. Alexander argues that the suburbs have been a poor substitute for the reasons that push people to suburbs: "...the suburbs formed by this withdrawal undermines the formation of intimate contacts in a devastating way." *The City as a Mechanism of Sustaining Human Contact*, in W.R. Ewald, Jr. (ed.), *Environment for Man: The Next Fifty Years*, Bloomington, Ind.: Indiana University Press, 1967, pp. 60-109, (p. 82).

<sup>1</sup>Lal, *Living Conditions in Multi-Storeyed Habitations*; Stevenson, Martin and O'Neill, *High Living*; Hole, *Social Effects of Planned Rehousing*; A. Rapoport, *Some Consumer Comments on a Designed Environment*, *Arena*, January 1967, pp. 176-178.

live in thirteen story slab blocks and six story maisonette blocks, than those who live in low-rise terraced houses.<sup>1</sup> 'Sense of belonging' to a community in terms of social interaction decreased among the residents as the floor levels increased. 'Belonging to dwelling' (i.e. identifying with the dwelling, rather than the community) was higher among the high-rise block residents than the people living in the low-rise houses. Rootlessness, partially influenced by the lack of a sense of belonging, is an important factor contributing to the attitude of isolation. The 'boxed-in quality' and the 'sterility' that Rapoport reports about are all aspects of isolation.<sup>2</sup> Definite adverse effects of isolated environments have even been carried further than merely feelings of alienation. For example, Heron argues that prolonged exposure to completely monotonous and unchanging isolated environments may lead to impaired thinking, disturbed visual perception and other even more pathological consequences.<sup>3</sup>

#### Alienation as a Mode of Experience

The second stage in the phenomenon of alienation is more of a coping experience. The stage occurs within the *internal ecological process* as we shall illustrate later in this study. This stage can be viewed as part of an intervening process. Basic personality structure, environmental conditions and the requirements of the need system are factors that affect this coping process as the individual evaluates his

---

<sup>1</sup>J. Scott, Testing a Housing Design Reference: A Pilot Study, *Architectural Association Quarterly*, v.2, n.1, 1970, pp. 23-31.

<sup>2</sup>Rapoport, Some Consumer Comments...

<sup>3</sup>W. Heron, The Pathology of Boredom, *Scientific American*, v.196, n.1, 1957, pp. 52-56.



immediate behavior space. Hence, alienation as a psychological property of the individual, is partially rooted in the discrepancy between the individual's actual surroundings and his expectations of a specific situation. Strain, the indicator of environmental loads and stress states, can be called the index of alienation. It manifests itself through such feelings as annoyance, discontent, helplessness, anger, etc.

#### Behavioral Consequences

The third stage in the process of alienation is the level of behavioral consequences of alienation. According to Barakat, actions and behavioral patterns can be conceptualized on a retreatism-involvement continuum.<sup>1</sup> In other words, an alienated person's behavior can be explained as either retreating from, complying with and/or, acting upon the immediate environment. No matter what the type of behavior, the individual's interaction with his environment is going to have an influence upon that behavior and the subsequent actions taken. This interaction is assessed by the individual in terms of his having control over the environmental elements. The higher the degree of controls, the higher the chances of coping successfully with the demands made by environmental forces. It would appear, then, that behavioral consequences are not only functions of environmental stimuli and personality structure (the psychological capacity of the individual) but they are also functions of the environmental elements which the individual can control, manipulate and change. This flexible characteristic of an environment (one that provides the structural

---

<sup>1</sup>Barakat, Alienation...

elements to be acted upon) is an aspect of the design process, which allows the individual to be motivated and to do something about the demands made by the environment that are conflicting with his own needs and desires. Alienation, resulting either from states of overcontrol or undercontrol in the environment, can be reduced or even eliminated by the autonomy of the individual over his immediate surroundings.

*Meaning-Value-Need*

Realism, which is absent in the various links of the Modern Movement chain, is not a mere copy of reality. It also reflects the activity which is inherent in reality and it means participating in the creation of an environment which is in a constant process of formation and change. The other "isms" (modernism, futurism, functionalism, etc.) fail to focus attention on human nature and the constantly changing reality.

Realism in the design process is the equivalent of *environmental adequacy*. This can only be achieved when the design process aims to comprehend the dialectical complexity of man rather than merely being the graphic embodiment of disconnected and loose triviality and the shallowness resulting therefrom. In other words, *environmental adequacy* refers to the provision for the manifold and constantly changing relations which man experiences. Stating it more unequivocally, it refers to an environment in which human needs are emphasized in the design elements and the objectification of design is significantly human. The very essence of the concept (environmental adequacy) then lies in the unity of idea and material realization.

In his critical analysis of previous interpretations of Marx's theory of alienation, Meszaros presents the following argument concerning the concept of realism:

realism reveals... [with environmental adequacy], those fundamental trends and necessary connections which are often deeply hidden beneath deceptive appearances, but which are of a vital importance for a real understanding of the human motivations and actions of the various historical situations. This is why mere means and stylistic aptitudes could never make someone become a real artist... What will determine whether he is a realist or not is what he *selects* from a mass of particular experiences to stand for the given, historically and socially specific, reality.<sup>1</sup>

The "fundamental trends" and "necessary connections" in the above statement are the interconnections between *meaning* and *value*, which have their basis in human *needs*.

The reality experienced by an individual is not a mere collection of elemental facts. It consists of units in which no part exists by itself. Phenomenal behavior<sup>2</sup> (experienced behavior), or one's behavior in one's own behavioral environment rather than in someone else's, assumes that the individual experiences the environment not as facts and significance belonging to two different realms but in an "intrinsically coherent whole."<sup>3</sup> Thus, phenomenal behavior becomes meaningful through *insight* which can also be described as "direct awareness of determination."<sup>4</sup> Both "insight" and the "coherent whole"

<sup>1</sup>Meszaros, *Marx's Theory of Alienation*, p. 196.

<sup>2</sup>K. Koffka, *Principles of Gestalt Psychology*, New York: Harcourt, Brace and World, Inc., 1935, p. 40.

<sup>3</sup>*Ibid.*, p. 176.

<sup>4</sup>W. Kohler, *Gestalt Psychology*, New York: The New American Library, Inc., 1947, p. 200.

are functions of relations. These relations make up the structure and the meaning of the environmental elements. In other words, meaning consists of relations and mutual dependence that tends to " 'order' reality".<sup>1</sup>

Norberg-Schulz points out that one experiences a meaning when the stimulus symbolizes a 'higher' objective.<sup>2</sup> To state it differently, the interpretation of the situation, as it is experienced, is *meaningful* only after environmental adequacy has been achieved. Perception gives the stimulus an adequate meaning--an "intentional depth."<sup>3</sup> One's actions or behavior becomes intentional when *values* influence one's choice of alternatives. In other words, there is an interconnection between meaning and value. 'Higher objects' such as 'home', 'town', 'country' are social attachments and cultural products which are part of the value system.<sup>4</sup> Through these value systems one can understand the interdependence of the symbol milieu and the physical milieu. It is through the mutual act of both milieus that the environment offers rich possibilities of identification and becomes *meaningful*. For any environment to provide a meaningful interaction between the individual and his direct actions, a superimposed value system for the individual must exist.

<sup>1</sup>C. Norberg-Schulz, *Meaning in Architecture*, in C. Jencks and G. Baird (ed.s) *Meaning in Architecture*, New York: George Braziller, 1970, pp. 214-229.

<sup>2</sup>C. Norberg-Schulz, *Existence, Space and Architecture*, New York: Praeger Publishers, 1971, p. 38.

<sup>3</sup>C. Norberg-Schulz, *Intentions in Architecture*, Cambridge, Mass.: MIT-Press, 1965, p. 31.

<sup>4</sup>Norberg-Schulz, *Meaning in Architecture*, p. 224.

How does one then, in reality comprehend the interdependence of the symbol milieu and the physical milieu and interpret the situation as meaningful? Or, in more general terms, how does the total conception of meaning acquired by the individual lead to an evaluation phenomenon? The answer to both of the questions must be sought in the emergence of the total conception of meaning through methods investigating the nature, essential properties, and the relations between the two different but yet integrated environments. There are certain intuitive and true reasons, besides just the apparent physical aspects, that must be looked for.

The individual can comprehend the coherent elements of a unity through a certain *consciousness*. This does not mean merely the perception and comprehension of the external appearance. In the course of an individual's life experience and in his interaction with the environment, principles of organization, which aid him in understanding the environment, evolve spontaneously. Spontaneity here, implies two major groups of phenomena: 1) submissiveness to over-controlled environment, 2) resentment towards the situation and a desire to change the immediate source of disturbance. In either case, the individual realizes that the environment external to him does not exist independently of him.

A second step in the emergence of the total conception of meaning is seen in *retrospection*. Environment exists with reference to a certain past experience and the knowledge acquired pertaining to that situation. Therefore, it is up to the individual's mental awareness as to how the unity will be interpreted through those combined elements. This

environmental unity is in a process of continual change and transformation. Everyday experience is not something taken at face value by the individual. The awareness of this continual transformation results in the development of a filtering process in the mind. The process filters the implications of the new experiences and their presuppositions. Thus, retrospection has a temporal as well as a spatial quality which leads to the meaning of a certain environmental interaction.

*Historical-social process* is the third step we shall consider in the development of the total conception of meaning. Consciousness, as mentioned earlier, starts merely with the awareness of the immediate sensuous environment and the limited human contact with this environment. This consciousness reflects the social being—a phenomenon depicted as the material life of society.<sup>1</sup> To satisfy certain needs man has to produce material goods—food, clothes, houses, means of transport, tools, etc. Within this process man is in continual interaction with other people. Consequently, definite relations are developed between people. These relations make up the social being.

On the other hand, social ideas, views and sentiments constitute the *social consciousness* which develops out of this shared experience. This side of social life is expressed in political ideas, philosophical teachings, religious beliefs, artistic works, moral standards, etc.

The relationship between social being and social consciousness is

---

<sup>1</sup>Glezerman and Kursanov (ed.s), *Historical Materialism: Basic Problems*, (esp. pp. 7-47).

significant in understanding the development of the total conception of meaning. The "historically evolving consciousness"<sup>1</sup> as it is referred to by Mannheim, occurs within a structural transition that takes place in the social process. Intended meanings become attributed meanings within this transition. In rural societies or among squatter settlers the meaning of a house is *intended*. Whereas, in today's industrialized urban societies, the individual has to attribute a meaning to certain design elements that are intended by someone else--the designer. Just as the concept of meaning has changed while transition occurred from "folk" to "class", the interpretation of environmental meaning has changed as one mode of building construction has evolved to another.

The above argument suggests several points: neither consciousness nor total conception of meaning is static; everyday activity in relation to environment, and what is actually experienced in that environment, cannot be understood within the context of the sum of discrete events; the actions and behavior of the individual are comprehensible only in terms of meaning which in turn leads to another meaning; interpretation of a particular situation depends upon a unity consisting of coherent elements of the environment (consciousness) and interdependence of meaning. Another result of the total conception of meaning is that meaning changes not only within itself but also in its totality from one situation to another.

As stated earlier, alienation leads to passivity in the individual. The process of consciousness, on the other hand, requires activity.

---

<sup>1</sup>K. Mannheim, *Ideology and Utopia*, trans. L. Wirth and E. Shils, New York: Harcourt, Brace and World, Inc., 1936, p. 68.

Man's alienation from his environment prevents him from appropriating the environment as a whole but forces the individual to sharpen his sphere of attention on mere utility. Needless to say, this limitation leads to the depletion of human senses. Physical and mental capacities are replaced by the estrangement of all senses. Thus, meanings and needs that emerge under these conditions inevitably are related to "the immediacy of private utility and private appropriation."<sup>1</sup>

When the "abstraction" of "formal relationships" is emphasized in the design process (as in some of the architectural movements, e.g. cubism, de stijl, futurism, etc.) the comprehensible meaning (realism) is lost in favor of the dominating presence of material objects. The consequence of this phenomenon, as mentioned earlier, is alienation-- "withdrawal from meaning has been added to the withdrawal from the object."<sup>2</sup>

"Formal relations without any reference to content and meaning",<sup>3</sup> as Arnheim argues, are tendencies for simplicity and stillness emphasized mainly for operational purposes. However, the essence of visual experience cannot be described merely by its physical characteristics-- e.g. size, distance, orientation, hue, etc. The existence of a percept does not generate from these static forces alone but mainly from their activity. The expression and meaning of the environment is beyond the "stimulus"--the message reaching the eye from the physical

<sup>1</sup> Meszaros, *Marx's Theory of Alienation*, p. 204.

<sup>2</sup> R. Arnheim, *Art and Visual Perception*, Berkeley, Calif.: University of California Press, 1971, p. 133.

<sup>3</sup> *Ibid.*, p. 423.



environment, which is the explanation offered by the *behavioral theorists* of meaning. The concept of meaning and the cues from the environmental context even go beyond the dualistic view of meaning (generally referred to as *mentalist view*), which searches for a link between material and non-material events.<sup>1</sup>

When viewed in the light of the argument presented above, it becomes apparent that meaning must be a "relational or process concept"<sup>2</sup> for the development of the total conception of meaning, rather than a set of variants. In other words, there is a *representational mediation process* involved in the interpretation of environmental meaning.

Osgood, Suci and Tannenbaum summarize this phenomenon as follows:

"Whenever some stimulus other than the significate is contiguous with the significate, it will acquire an increment of association with some portion of the total behavior elicited by the significate as a representational mediation process."<sup>3</sup> Significate refers to any stimulus which, under a given situation, produces a predictable pattern of behavior.

"Architectural meaning", according to Hershberger,<sup>4</sup> is composed of the mentalistic and mediational views. Building upon these views,

<sup>1</sup>C.K. Ogden and I.A. Richards, *The Meaning of Meaning*, New York: Harcourt, Brace, 1923.

<sup>2</sup>C.E. Osgood, G.J. Suci, P.H. Tannenbaum, *Measurement of Meaning*, Urbana, Ill.: University of Illinois Press, 1957, p. 9.

<sup>3</sup>*Ibid.*, p. 6.

<sup>4</sup>R.G. Hershberger, "A Study of Meaning and Architecture," unpublished Ph.D. Dissertation, Dept. of Architecture, University of Pennsylvania, 1969, pp. 37-42.

*b*

Hersberger classifies the types of "architectural meaning" as:

1. Presentational Meaning--perceptual representations; internalized or representational stimuli; concrete.
2. Referential Meaning--imagined representations; internalized or representational stimuli; abstract.
3. Affective Meaning--further internal responses related to representations; feelings and emotions brought about by representations.
4. Evaluational Meaning--product of critical attitudes and ideas rather than emotions and feelings.
5. Prescriptive Meaning--a disposition to respond; in retrospect, becomes purpose.

The implication of this interpretation of architectural meaning has been exercised by modern architects in such a way that the omission of the historical-social process in the total conception of meaning has been inevitable. Furthermore, this leads to the treatment of values independently of their social purposes. However, experience and the socio-historical study of meaning suggest that cognitive meaning, meaningful values and social norms cannot be separated from one another.<sup>1</sup> The presence of meaning, values and norms in all socio-cultural phenomena and the difference of the historical character of meaning from the other two stages<sup>1</sup> of total conception (consciousness and retrospection) can strongly be supported by the identity of meaning, values and norms manifested in the most diverse individual observational elements in the environment, carrying widely

<sup>1</sup>Meszaros, *Marx's Theory of Alienation*, pp. 190-195; P.A. Sorokin, *Society, Culture, and Personality: Their Structure and Dynamics*, New York: Cooper Square Publishers, 1962, (1947), (esp. pp. 47-52).

different meanings.

One's daily activity is not only interpreted in terms of physical stimuli, but also in meaningful relationships. These are in turn highly dependent upon values. The interconnection between meaning and value, and the structure of meaning as well as of value, are the products of man himself. Both meaning and value are procreations of human needs. That is, the human need system is the generative basis for all the values which we assert.

Sherif defines values as "affectively charged stimuli that cause the formation of social attitudes."<sup>1</sup> Once a value is internalized by the individual and a state of readiness is formed in regard to related environmental objects or situations, then that value becomes a content of the attitude. By no means does this denote a static character, for needs are of a changing nature. This dynamism is a function of needs and their gratification. To state it more unequivocally, in the course of social history (i.e. man's confrontation with nature and with himself) "self-constituting self-realization"<sup>2</sup> of man is both his need and his value.

Every single object in his environment affects the individual and thus occupies a definite place in the human system of values. Psychology of values is the focal point of the problem of customs, tradition, social norms and meaning. The concept of meaning is revealed as *value-bound*. In other words, the structure of meaning

<sup>1</sup>M. Sherif, *The Psychology of Social Norms*, New York: Harper and Row Publishers, 1936, p. 128.

<sup>2</sup>Meszaros, *Marx's Theory of Alienation*, p. 193.

is linked to the human structure of values. This emerges from the self-mediating character of the individual. The mediation process in the interpretation of meaning depends highly upon the value system. Value is a cultural product, i.e. culture has not only existence but also meaning and value.

Parallel to meaning, value can be conceptualized as a process "ordering"<sup>1</sup> man's relationship to nature and to other men. Its development and character is determined by the nature of human needs. Stated less ambiguously, these are concrete events of all the realms-- physical, psychological and social-condition values.

The historical development of human needs gives a historical character to the values which are deep rooted in human needs. This linkage between needs and values suggests that values are not just mere assumptions of metaphysical characteristics and affective quality. Nor are they simplistic enough to be reducible to a single value as some researchers propose for the sake of methodology.<sup>2</sup> The character of values is determined by the nature of the needs. This phenomenon generates a wide range spectrum for values within the socio-historical process. The assertion of these values may vary from a small gesture to a philosophical argument and from a humbly furnished squatter house to a fashionably decorated mansion. Whatever the case, all of these values correspond to certain needs. This even includes an alienated

---

<sup>1</sup>G. Kepes, *Language of Vision*, Chicago: Paul Theobald Co., 1944, p. 201.

<sup>2</sup>C. Alexander and B. Poyner, *The Atoms of Environmental Structure*, in G.T. Moore (ed.), *Emerging Methods in Environmental Design and Planning*, Cambridge, Mass.: MIT Press, 1970, pp. 308-321.

value which is rooted in some correspondingly alienated need. Value, therefore, cannot be isolated from the rest of reality. The validity of eliminating from environmental consideration not only a wide range of values but values of different levels becomes questionable.

Winkelhake, in his criticism of Alexander's "pattern language",<sup>1</sup> refers to such a reductionist attitude as "old-fashioned view of perceptual structure" and a failure to reflect "the differentials of both language and human value."<sup>2</sup>

In its broadest scope a need can be defined as "a readiness or tendency to persist toward and to perform a consummatory response relative to a certain more or less arbitrarily chosen 'standard' goal object or situation and to avoid or go away from certain other objects or situations."<sup>3</sup> Need, as it is defined here, is effective for the exchange process that occurs within the dominance of abstracted systems, which are the results of selections by the individual according to his interests or intellectual bias or philosophical viewpoint.

On the other hand, in a concrete system (a nonrandom accumulation of matter and energy in a physical space and time, which is organized into co-acting with the interrelated elements), the character of need

---

<sup>1</sup>C. Alexander, S. Ishikawa, and M. Silverstein, *A Pattern Language Which Generates Multi-Service Centers*, Berkeley, Calif.: Center for Environmental Structure, 1968; also: C. Alexander, et al., *Houses Generated by Patterns*, Berkeley, Calif.: Center for Environmental Structure, 1970.

<sup>2</sup>C. Winkelhake, "Behavior Models", Dept. of Arch., University of Illinois, October 1970, (Mimeographed).

<sup>3</sup>E.C. Tolman, A Psychological Model, in T. Parsons and E.A. Shils (ed.s), *Toward a General Theory of Action*, New York: Harper and Row Publishers, 1962, (1951), pp. 279-361, (p. 335).

becomes slightly different. Some researchers even differentiate by calling this other type of need a "drive".<sup>1</sup> Physiological drives can be considered as independent variables of the model presented. The need itself is part of the major intervening process.

The maintenance of our biological system depends essentially on the fulfillment of physiological drives, which can be referred to as the physiologically defined conditions. Only after the proper functioning of the biological system can we speak of fulfilling other needs. After initiating the physiological condition, drives lead up to the needs (the postulated resultants). Drives such as hunger, thirst, temperature regulation of the body, sleepiness, sexual desire, pain avoidance and other such fundamental drives are undoubtedly the most preeminent of all needs. If this is the case, it is then quite valid to present the need system in a hierarchical order.<sup>2</sup>

The need system can be conceptualized as a set of interconnecting domains, each domain corresponding to a different order of hierarchy of needs. In his hierarchy of needs, Maslow assumes that unless the basic 'lower' needs are satisfied (a state of proper gratification), the 'higher' needs cannot develop.<sup>3</sup> The ordering of basic needs from lower to higher runs as follows: physiological needs, safety needs, belongingness and love needs, esteem needs, need for self-actualization.

---

<sup>1</sup>Toiman, A Psychological Model, p. 288.

<sup>2</sup>A. H. Maslow, 'Higher' and 'Lower' Needs, *Journ. Psychol.*, v.25, 1948, pp. 433-436; see also J.M. Fitch, *American Building: The Environmental Forces that Shaped It*, 2nd ed. rev.; Boston: Houghton Mifflin Co., 1972.

<sup>3</sup>A.H. Maslow, *Motivation and Personality*, New York: Harper and Row Publishers, 1954, pp. 97-104.

Before going into the means for gratification of these needs, let us look at some of them a bit more closely. A hierarchy not only exists among the different classified needs but also within these classifications as well. For example, one can live without sexual satisfaction but not with hunger. The consequences of the failure to gratify the physiological drives may lead to pathological and unhealthy action systems. The arrangement of a hierarchy on the basis of the relative potency of the needs may not be as clear cut in the higher needs as it is in the lower needs. After a high need has emerged, the organism is dominated by it rather than by the physiological drives. Domination passes from the physiological level to needs that have goals in the social and psychological levels. The demarcation lines however, of some of the needs, are not very clear at times. In other words, there can be diffusion from one level to another. Tolman conceptualizes this diffusion with semi-permeable membranes between the domains.<sup>1</sup>

In addition to the basic needs, the learning process and the psychodynamic mechanism may produce secondary or even tertiary needs. After a certain level of gratification, the need system in an individual, due to the bilateral diffusion and the secondary or tertiary needs (e.g. desire to know, understand and to manipulate) may incline to confuse the end with the means. Allport's doctrine of "functional autonomy" states that the means to an end may become the prime satisfactions themselves.<sup>2</sup> Therefore, not only do the basic

---

<sup>1</sup>Tolman, *A Psychological Model*, pp. 319-323.

<sup>2</sup>G.W. Allport, *Pattern and Growth in Personality*, New York: Holt, Rinehart & Winston, 1937, pp. 226-253

needs and their satisfaction affect our motivations and personality, and consequently our behavior, but so do the cognitive aspects of the whole exchange process, i.e. not all behavior is totally determined by the basic needs. In other words, cognitive, conative and affective needs act interdependently rather than as isolated entities.

A person is not locked up in a closed box while this process is occurring. The environment he is in, the situation he faces, are components in this process as well. The "momentary whole situation, that is, the momentary structure and the state of the person (P) and the psychological environment (E)"<sup>1</sup> will affect the psychological events (e.g. actions, coping, emotions, expressions, etc.) and thus will determine the individual's behavior (B). Lewin has expressed this mathematically:  $B=f(P,E)$ , (everyday behavior is a function of the personality and the environment). Environment is understood not only in its physical sense but also in its social and psychological meaning. (See Figure 1.1).

This is not meant to be a study of the theory of motivation and the development of personality. However, the relative importance of the physical environment and its significance on personality and behavior becomes obvious when we look at some of the models that characterize the development of action systems. White's<sup>2</sup>

---

<sup>1</sup>K. Lewin, *A Dynamic Theory of Personality*, New York: McGraw-Hill Book Co., 1935, p. 79.

<sup>2</sup>R. W. White, Competence and the Psychosexual Stages of Development, in R.S. Lazarus and E.M. Opton, Jr. (ed.s), *Personality*, Middlesex, England: Penguin Books, 1967, pp. 142-166.



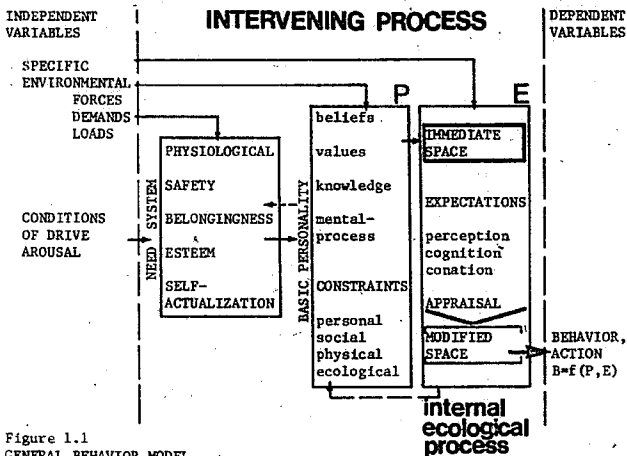


Figure 1.1  
GENERAL BEHAVIOR MODEL  
Adopted and modified from Tolman (1951).

principle of "effectance" (the desire to have a direct effect on the environment) emphasizes the importance of the man-environment relationship.

In his critique of Freud's psychosexual theory and in his analysis thereof, White suggests the "effectance" concept be added to the development model. To White, effectance motivation is an inherent property of the child, and it helps the child's development of competence. Thus, White proceeds to examine each of the psychosexual stages put forward by Freud and attacks the narrowness of the instinctual drives in the development of competence. Acknowledging the contribution of instinctual energies, White also posits that the intrinsical gratification of exploration and manipulation of the

environment produces competence. Competence, as a result of accumulated interactions with the environment, will definitely support one's confidence in dealing with the various aspects of the environment. The significance of effectance, or the desire to explore, to manipulate and to have a control over the environment will become clear when we go into the stress model and investigate *environmental flexibility*, later in this study.

Among others, Erikson<sup>1</sup> and Lewin<sup>2</sup> have postulated "locomotion", which can be regarded as a means in changing the structure of the environment in a child's development. This formulation is actually very much in agreement with the competence model. Locomotion becomes an effective tool to cope with some of the difficulties resulting from the spatial order. The concept of competence through an effective control over the physical environment takes up the whole realm of learned behavior. This need to manipulate the environment gives the individual an opportunity to do something interesting in the environment and to relieve part of the tension built up due to some of the environmental demands.

Effectance should not be considered as a viscerogenic motive.<sup>3</sup> Among

<sup>1</sup>E.H. Erikson, *Childhood and Society*, New York: Norton, 1950.

<sup>2</sup>K. Lewin, *Principles of Topological Psychology*, New York: McGraw-Hill Book Co., 1936.

<sup>3</sup>H.A. Murray differentiates between two basic types of needs: primary (viscerogenic) needs are those based upon the organic requirements for physical survival, pleasure and avoidance of pain, and include thirst, hunger, elimination, secretion; secondary (psychogenic) needs are those independent of direct organic processes and these are actions associated with inanimate objects, ambition, recognition, autonomy, etc. For a more detailed explanation and classification of primary and secondary needs (thirteen primary needs and twenty-eight secondary ones) see his, *Explorations in Personality*, New York: Oxford University Press, 1938, (esp. pp. 79-83).

its other components is the symbolism that the person may attach to the meaning of a certain object or to the totality of the immediate environment. Whether this is part of the individual's unconscious (Freud), or whether it is the archetype (Jung's term for the individual unconscious plus a collective unconscious in which are deposited certain basic and timeless nodes of the psychic energy), symbolism can be considered as one of the inner needs of the higher order. In the housing situation, this type of symbolism is quite often exaggerated,<sup>1</sup> and even carried out to the extent that housing is regarded merely as a "mediating process of affirmation and denial, a medium for statements of allegiance and expression of needs."<sup>2</sup> Certain aspects of the housing situation are more or less symbolically viewed by the inhabitants and to a degree this is accepted as a fulfillment of a need of the individuals concerned.<sup>3</sup> However, when symbolism takes on an all-important characteristic, it becomes totally irrational and unacceptable in our view.

Focusing on the means for gratification of the components of the need system, we will try to look at some of the reflections of this process on the housing situation. The gratification of physiological drives is not as dependent on preconditions as is that of higher needs. Most of the lower needs are more bodily and localized, compared to the higher

---

<sup>1</sup>Cooper, *The House As a Symbol of Self*.

<sup>2</sup>G. Rand, Children's Images of Houses: A Prolegomena to the Study of Why People Still Want Pitched Roofs, in W.J. Mitchell (ed.), *Proceedings of the EDRA 3/ARB Conference*, 2 Vols., Los Angeles: University of California Press, 1972, v.1, ch.6-9, p. 6-9-1.

<sup>3</sup>A Rapoport, *House, Form and Culture*, Englewood Cliffs, N.J.: Prentice-Hall Inc., 1969, (esp. pp. 46-82).

needs. Also, the lower needs are more urgent than the higher ones. For example, one of the primary needs, the regulation of body temperature, is gratified by clothing and shelter depending upon the varied external environmental forces. The first goal is to provide adequate means for the gratification of the needs.

As we go from the primary need satisfaction to the next domain of needs, i.e. safety, we will be required to make use of additional means for gratification purposes. These additional means can be depicted as barriers or enclosing units or locks that may provide security and protection from some outside dangers. Thus, means to gratify the lower needs are rather easy to define. However, as the secondary and tertiary need mechanisms come into focus in this process, the needs start being products of abstracted systems; they also become more personal and idiosyncratic. Whether these cognitive and aesthetic needs are learned sublimated expressions of the primitive sexual and aggressive instincts (according to Freud), or whether they are inborn qualities whose expressions depend upon favorable rather than unfavorable life circumstances (according to Maslow, White), they all modify the individual's actions and behavior.

Actually, the coping mechanism, mentioned later herein, may be substituted by an expression mechanism at certain instances. If we could draw a demarcation line between the two mechanisms, we could also differentiate between them as "useful" and "useless" behavior, respectively.<sup>1</sup> Even though they may be useless, these personal and idiosyncratic

---

<sup>1</sup>Maslow, *Motivation and Personality*, p. 132.

expressions are going to affect the psychological state of the individual. Rational and utilitarian means for gratification of the needs may be supplemented with irrational and non-functional elements of expression of the individual. In design these non-functional elements could be reflected in the color of the walls, shape of the fences, texture of the door, decoration of the window, choice (if there is any) of path between two points, etc.

Coping behavior characteristically attempts to modify the immediate space in which behavior takes place, whereas expressive behavior usually has no effect on the environment, except perhaps for a slight feedback to the individual from the environment. Both the coping and expressive behaviors are tied to motives, beliefs and expectations concerning the situation which differ from person to person. The success or the failure of both the coping and expressive mechanisms are influential field forces that act upon the psychological state of the person.

The structure of psychological facts and the satisfaction of needs, especially the higher needs, depend highly upon the structure of the physical and social factors. The influence of external demands can occur by way of a perceptual process which usually leads to a change in the cognitive structure of the field. *The cognitive process of appraisal, as a result, will affect our coping process with the environmental situation.* This series of events is going to determine or modify the individual's behavior in that situation.

#### *Summary*

*-Objectification* (the act of personalization of the environmental

elements) of the total design process may lead to *alienation* when the design elements acquire an existence independent of man.

-Most present treatments of the man-environment relations are twofold:

1. ethological studies are used to implement design decisions; and
2. the environment is assumed to be a symbolic extension of man's activities. Neither approach is in accord with reality; neither approach can soundly bring solutions to the alienation problem; both approaches force a passivity upon the individual which is contrary to the process of consciousness.

-The sources of alienation are states of *overcontrol* and *undercontrol*.

-*States of overcontrol* (environments that deprive the individual from controlling, manipulating and changing the immediate surroundings) emerge from: 1. *highly inflexible environments* which cause a powerlessness in the individual; 2. the problem of *identity* (false identification of the problem or a problem solving approach which doesn't identify the problem at hand) arising from a lack of communication between the designer and the inhabitant; 3. the modern idea of *efficiency*, which promotes one aspect of the total scope of design to be emphasized (e.g. technology, economy, etc.); 4. a *demand for conformity* which does not recognize the difference between the intended and the actual utilization of space.

-*States of undercontrol* (environments that do not allow or accommodate for anything beyond an extramural experience) emerge from: 1. a *lack of realism* in which the vital links between life activity and the design process are not adequately bridged; 2. the *isolation* of the individual from his environment (this is more evident in concepts such as suburbia, planned environments, etc.)

-*Environmental adequacy* (provision for the dynamic characteristics of life activity) can be achieved only through the recognition of dialectics of *meaning-value-need*. The total conception of meaning emerges from *consciousness, retrospection, and the historical social process*. A study of each aspect shows the importance of *cognitive meaning*. Value is a cultural product which affects the social attitudes.

The character of value is the result of abstract thinking but it is determined by the nature of material needs. Needs are viewed in a hierarchical order in which the lower needs (physiological and safety needs) must be satisfied before the higher needs (belonging and love needs, esteem and the need for self-actualization) become dominant.

-The personality structure and the immediate environment are basic parameters that influence behavior and actions; "effectance" (the desire to have a direct effect upon the environment) is one motivation that must be integrated into the design criteria; "effectance" affects the coping process through cognitive means.

## Chapter Two

## STRESS AS A UNIT

The actions and behavior which take place in a housing environment are inseparable processes from the enclosed space which defines the boundaries for this setting. Hence, these actions can by no means, be realistically seen as resting in an *a posteriori* relation to the housing environment. To state it more unequivocally, one's sense of space and relationship in a housing environment is phenomenal rather than being dependent upon some cause-and-effect type of behavioral cue. Not only is there a complexity resulting from this phenomenal characteristic, but there is also a complexity resulting from the wide range of factors that are involved. Acknowledgement of all inherent factors, as well as those which are apparent, must be the primary concern in the design process. Recognition of the fact that the housing environment connects with the full range of human needs, feelings, cultural and idiosyncratic dispositions is not only a must for a comprehensive understanding of the ecological nature of the man-environment relationship, but also a necessity for a sensitive and realistic interpretation of the life process. Only then can the design process become meaningful to the inhabitant in the most realistic sense.

The wide range of factors that are involved in the housing environment have been separately the focus of different disciplines. Yet all of



these factors exist invariably as an integrated whole in the housing environment. While physiologists concentrate on the relations between physical environmental conditions and the functioning of the body, psychologists lean towards understanding the behavior of the mind and its relation to the physical environment. Sociologists try to establish a frame-work for comprehending and interpreting social and cultural phenomena with regard to the environment. Most of these studies may be complete within themselves. However, the designer is left with a situation in which he must try to understand the essence of the problems that are relevant to the specific fields of knowledge. He must synthesize these isolated pieces of knowledge and translate them into a design language. The insights and findings of the behavioral sciences or physical sciences cover a broad territory of interconnections. Designers' attempts to achieve the task of interconnection have not been very successful in most cases. This failure is attributed to the complexity of the task, to the narrow perspective that the designers have been used to looking from, or to the lack of clearness of the concepts and the frame-work established by other disciplines. Whatever the reasons may be, the crucial problem of the designer still remains his inability to comprehend fully the human activity and its relationship to the housing environment.

One of the more apparent indications of this lack of understanding can easily be seen in the reductionist attitude of the designers. The reductionist theory, according to which the problem-solving process can be reduced to one or another sort of essence, is neither defensible nor reasonable. Yet, most often operational factors and the necessity for a scientific methodology are presented in defense of this

approach; however, these reasons and arguments are far from satisfactory. They are not only self-contradictory, but they are also opposed to human nature. One major shortcoming of this type of approach is that both the methodology and the built-environment are assumed to be an end product rather than a tool and a process. While advocates of present day scientific methods condemn the fetishistic character of the intuitive methods, they nonetheless repeat the very same errors that they are criticizing vehemently. Even in the most objective studies or projects, the designer makes decisions which are based upon intentions and purposes that are the product of his own intellectual activity. Obviously, these motives are in an *a priori* relation to the program and the specifications of the design project.<sup>1</sup> Furthermore, the general tendency seemingly is to focus more elaborately on the methodological issues rather than on the problem itself, which is most often ill-defined. Another pitfall that lies at the heart of the matter is the intentional or unintentional denial of the dialectical complexity in the ecological nature of relationships between man and his environment. Any unicausal view of human behavior with respect to the housing environment reduces this complexity and therefore oversimplifies human nature and all the factors that are relevant to the housing process.

Housing is a corporate process that cannot be reduced to its components.

The factors involved in this process, and the wide variety of

---

<sup>1</sup>A. Colquhoun questions whether the designer, who is more teleologically oriented, understands the mental processes that are involved during the course of a design project. See his article: Typology and Design Method, *Arenz*, June 1967, pp. 11-14.

interconnections, require the designer to absorb as much material as possible from other fields of knowledge in order to propose a design scheme that is in harmony with reality. Any design proposed not in accordance with actual life processes is bound to overlook the remarkable continuity and the true characteristics of this process. Therefore, any conceptual model dealing with the housing environment must include an integrating concept that is applicable to all different aspects of housing studied separately in different disciplines of knowledge. This means a concept relevant to the studies done in the physical sciences, physiology, psychology, sociology, and also in the field of architecture, must be a common denominator in translating certain requirements into design language and, prior to that, in understanding the phenomena that man is faced with in a housing environment.

With the above considerations in mind, the concept of *stress* has been used in this study to explain the environmental phenomena. Two reasons have been the guiding factors in the adoption of the stress syndrome: they are *conceptual* and *operational*. Conceptually, stress is an integrating concept which can fundamentally connect the interrelated but practically isolated disciplines of physiology, psychology, sociology, architecture, and so forth. Operationally, stress analysis has a potential to shed light on some of the phenomenological problems being faced in the housing process, whether or not solutions are generated. First, a very brief review of the different stress models will be given. After this review and an exploration into some specific environmental considerations in the light of the stress syndrome, a conceptual model of environmental

stress will be constructed.

The term *stress* has been endowed with two fundamentally different definitions by physiologists and social scientists. One definition emphasizes the stimulus condition. To the list of researchers who dealt with the stress phenomenon can be added some planners and designers, who have been investigating specific issues, such as interactions of man and the physical environment. Under this definition, stress is conceptualized as an agent which forces the individual to respond to changes in his environment in order to maintain equilibrium in his relationships with the events occurring in the environment. For example, Basowitz and his associates consider the stimulus that produces a conscious and reportable experience of intense dread and a foreboding feeling as stress.<sup>1</sup> Hence, stress is any event that induces anxiety and that poses a threat to the integrity of the individual. According to this definition, any stimulus condition that overloads the coping capacity of the individual, causing a disturbance (mainly an affective response) is considered to be a stress situation. However, the findings of Basowitz and his associates' extensive research--the psychosomatic research of individuals' responses in paratroop training--led them to reconsider their position on the definition of stress. Their new position is to consider stress as a response to the internal and external processes rather than as a stimulus imposed upon the individual.<sup>2</sup> The shift of their position

---

<sup>1</sup>H. Basowitz, et al., *Anxiety and Stress: An Interdisciplinary Study of a Life Situation*, New York: McGraw-Hill Book Co., 1955, p. 7.

<sup>2</sup>*Ibid.*, pp. 288-301.

is attributed to the fact that "stress does not conform to an *a priori* value judgment of what *should* happen, but can only be determined by observations of what *does* happen."<sup>1</sup> This conclusion was based on a wide variation of responses to the exposure to danger and possible failure, which were believed to constitute threats to the individual.

Janis conceives of stress as a highly traumatic event.<sup>2</sup> The disruptive emotional impact of stress is viewed in three major phases of danger situations: 1. *threat phase*, in which the individual becomes aware of an approaching danger; 2. *danger impact phase*, in which the individual confronts the danger in the immediate environment; 3. *danger victimization phase*, in which the individual perceives his losses while the danger has subsided or terminated. Emotional reactions to the stressful events include apprehensive avoidance, stunned immobility, apathy and depression, docile dependency, and aggressive irritability. These emotional reactions are affected by the situational and dispositional determinants such as personality structure, ideologies and rationale, self-conceptions, expectation, the degree of identification, and so forth. Elsewhere, Janis also argues that prolonged stress exposures and sudden catastrophies (e.g. natural disasters and man-made calamities) damage the sense of self-confidence about coping with environmental threats.<sup>3</sup> As argued by Janis, this may even lead to changes in the personality structure.

---

<sup>1</sup>Basowitz, et al., *Anxiety and Stress*, p. 288.

<sup>2</sup>I.L. Janis, Problems of Theory in the Analysis of Stress Behavior, *The Journal of Social Issues*, v.10, n.3, 1954, pp. 12-25.

<sup>3</sup>I.L. Janis, *Stress and Frustration*, New York: Harcourt Brace Jovanovich, Inc., 1969, p. 73.

Included in this category, where stress is defined as a stimulus situation, are some models which emphasize the alterations in the physiological processes.<sup>1</sup> These psychosomatic models of stress indicate the importance and the pathological consequences through the changes in physiological processes. As a result of the external stresses, anxiety and fear may be expressed through subjective feelings of intense dread and discomfort. If the conflicts arising from the stress situation are not handled directly through these subjective feelings, then the internal dissipation of tension, which will lead to organic changes, is unavoidable. The psychosomatic models of stress where the severe psychological stress is not believed to occur independently of physiological activity, are the closest to the biochemical models, although the latter conceptualize the stress as an intervening state rather than a stimulus.

The second definition of stress is based upon both stimuli and responses. Here, stress is viewed as a stimulus situation with the consequent occurrence of responses or changes in the individual's behavior pattern. Hence, stress is an intervening state between the previous constraints and the resulting efforts to reduce these constraints. Restricted to biological systems, Selye elaborated on this notion of stress.<sup>2</sup> This is illustrated in the General Adaptation Syndrome (GAS) at the physiological and biochemical levels. Any stimulus that produces stress is a stressor. The stressor will cause

---

<sup>1</sup>F. Alexander, *Psychosomatic Medicine, Its Principles and Application*, New York: Norton, 1950.

<sup>2</sup>H. Selye, *The Stress of Life*, New York: McGraw-Hill Book Co., 1956.

a stress condition in three stages: 1. *alarm reaction*, in which the organism is activated to defend itself against the stressor; this mobilization of the organism's defenses is achieved by the release of adrenocorticotrophic hormones (ACTH) in the pituitary, followed by the production of corticoids by the adrenal cortex; 2. *stage of resistance*, in which the organism reverses its reaction from that of the first stage; reserves of cortocoid are accumulated; and 3. *stage of exhaustion*, in which once again the reserve corticoid is exhausted; this stage may be terminal and irreversible depending on the intensity of the stressor. It is clear from these stages that stress is defined as the resistive forces or adoptive responses mobilized within the organism in response to the stressors.

Without changing the fundamental premises that GAS is based upon, Dohrenwend carried Selye's studies one step further.<sup>1</sup> A central assumption of the GAS is that the individual makes an effort to reduce constraints. These constraints are the psychological forces exerted consciously or unconsciously by the individual to protect himself from the harmful effects called for by the events occurring in the environment. While extending Selye's strictly biochemical model into the realms of the social environment, Dohrenwend distinguished between two types of constraints: 1. *external constraints*, those resources that are available in the environment and which the individual can utilize in the adaptation processes; and 2. *internal constraints*, those resources that the individual has by means of inner drives, desires, and internalized rules or prescriptions. The nature of the adaptation syndrome depends

---

<sup>1</sup>B.P. Dohrenwend, The Social Psychological Nature of Stress: A Framework for Causal Inquiry, *Journ. Abnormal and Soc. Psychol.*, v.62, n.2, 1961, pp. 294-302.

on the relative strengths and the nature of external and internal constraints associated with that particular stressor. These mediating factors (the constraints) intervene between the stressor and the adaptation process. Whether the behavior is adaptive or maladaptive, the intervening state (stress) underlies both. The concept of constraints and their relation to the stress state is of significance to the concept of environmental stress which is the aim of this study.

Mechanic, working mainly with the problem of the social psychology of adaptation, defined stress as the discomforting responses of individuals to particular situations.<sup>1</sup> Stress denotes a response which is characterized by emotional tension, fear, depression, anxiety, conflict, and difficulty in adjustment.<sup>2</sup> The stress, acute (temporary and situational) or chronic (protracted and recurrent) manifests itself as the substantial indicator of physiological and psychological arousal. The utility of this approach, especially in social research, as Mechanic himself admits in a later study, is rather limited.<sup>3</sup>

Reconsidering his earlier position, he redefines stress as a discrepancy between an external challenge and the individual's potential response. The main reason for this change of position, according to Mechanic, lies in the measurability of objective discrepancies over perceived ones. However, it seems that this new definition of stress

---

<sup>1</sup>D. Mechanic, *Students Under Stress*, Glencoe, Ill.: The Free Press, 1962, p. 7.

<sup>2</sup>D. Mechanic and E.H. Volkart, *Stress, Illness Behavior, and Sick Role*, *American Sociological Review*, v.26, n.1, 1961, pp. 51-58.

<sup>3</sup>D. Mechanic, *Some Problems in Developing a Social Psychology of Adaptation to Stress*, in J.E. McGrath (ed.), *Social and Psychological Factors in Stress*, New York: Holt, Rinehart and Winston, Inc., 1970, pp. 104-123, (esp. 111-113).



which is proposed for operational purpose, is very limited in its scope. Furthermore, it recognizes only a small fraction--that of task performance, skill, ability, and experience--of the total socio-psychological domain.

After a review of the existing definitions of stress, Horvath defines it as a state which may impair psychological functions or cause decrement in performance of a goal-oriented task.<sup>1</sup> A stage prior to Selye's "alarm reaction" is suggested to characterize the organism as being in a state of dynamic equilibrium instead of being in a stress state prior to the threat or disturbance. A stress state occurs when crucial psychological variables are exposed to conditions which may disturb them well beyond their normal capacities. There are two types of crucial psychological variables: one which arouses the biological drives or fear; and the other which constitutes a threat to the personality structure or the ego, thereby arousing anxiety, failure, and frustration. Regardless of the type, the behavioral manifestations of psychological stress are disorganization and disruption.

Lazarus emphasizes "threat" as being the major intervening variable in his conceptualization of psychological stress.<sup>2</sup> The signs of threat are appraised or evaluated by the cognitive processes. The coping processes are dependent on these cognitive processes of appraisal. Therefore, psychological stress analysis must be distinguished from

---

<sup>1</sup>F.E. Horvath, *Psychological Stress: A Review of Definitions and Experimental Research*, *General Systems*, v.4, 1959, pp. 203-230.

<sup>2</sup>R.S. Lazarus, *Psychological Stress and Coping Process*, New York: McGraw-Hill Book Co., 1966, (esp. pp. 30-84).

other types of stress analysis by the intervening variable. Threat is characterized by two main properties: 1. *anticipation*, that involves expectations of future harm; and 2. *dependency* on cognitions, such as thought, perceptions, and so forth. The psychological stress situation, which is analogous to Selye's physiological stress, is viewed as an input situation (stimuli), which is followed by the intervening processes, and the consequent occurrence of reactions. Stress, much like the terms cognition and motivation, is a collective term. As can be inferred from the characteristics of threat, the individual's knowledge, beliefs, and past experiences affect his appraisal. Therefore, the process of appraisal is affected by the intensity of the threat as well as by the psychological make-up of the individual. The term cognitive, however, does not imply an adaptiveness in the positive sense of awareness and rationality.<sup>1</sup> Rather than the quality of thought, it only implies the existence of the thought process. The coping process, in addition to the cognitive processes of appraisal, also depends upon the appraisal of the coping activity which is defined as the secondary appraisal. Sources of information contributing to the secondary appraisal are two-fold, as in the primary appraisal: 1. *factors in stress configuration*, such as location of the agent of harm, inability of alternative coping actions, and situational constraints; and 2. *factors within psychological structure*, such as motive strength, ego resources, and coping dispositions.<sup>2</sup> In other words, after the primary appraisal

---

<sup>1</sup>R.S. Lazarus, Cognitive and Personality Factors Underlying Threat and Coping, in S. Levine and N.A. Scotch (ed.s), *Social Stress*, Chicago: Aldine Pub. Co., 1970, pp. 143-164 (p.162).

<sup>2</sup>R.S. Lazarus, *Psychological Stress and Coping Process*, p. 160.

deals with the situation itself, the secondary appraisal concerns itself more with the effect of the primary appraisal.

The stress model presented by Howard and Scott is based mainly upon an analysis of human functioning in problem solving terms.<sup>1</sup> Approaching this conceptual problem from the concept of energy, it is stated that failure in the mastery of problem solving necessitates an expenditure of energy, which otherwise has no fundamental character until it is expended. This energy is drawn from the physiological and psychological resources which are the potential supply of the organism for maintaining an equilibrium and for problem solving. Stress is experienced when an excess maintenance of tension exists. Tension here refers to the state of mobilization wherein energy and resources are bound up. The subsequent discomfort that follows the failure of mastery in problem solving is the state of stress. The problem solving phenomenon of human behavior is based on two assumptions: 1. when the environmental or self-induced threats are minimized, the human organism is at its most comfortable state; and 2. any threat from the environment motivates a response in the human organism to reduce that threat. Mastery in problem solving situations is accomplished when homeostasis or a new equilibrium state is established (condition of dynamic equilibrium). Therefore, any unsolved problem is a stressful stimulus since such stimulus is considered a threat which requires excess energy expenditure. Fundamentally, stressful sources (stimuli) are classified within different environmental domains:

---

<sup>1</sup>A. Howard and R.A. Scott, A Proposed Framework for the Analysis of Stress in the Human Organism, *Behavioral Science*, v.10, n.2, 1965, pp. 141-160.

psychological and socio-cultural environments constitute the symbolic stimuli; biochemical and physical environments constitute the non-symbolic stimuli. The different environments are also recognized as internal (psychological and biochemical) and external (socio-cultural and physical) stimuli. Problems arising from these environments do not necessarily have to be events to produce stress.

In accordance with the above model, Knowles uses the concept of stress to investigate the relationship between urban form and stability relative to the natural environment.<sup>1</sup> Stress, in this study is defined as the environmental condition which calls upon some response in the living system. Energy exchanges are required to bring a system into equilibrium with the changing environmental conditions (stress). These energy exchanges are referred to as events. An event manifests itself in a displacement which is measurable as well as perceivable. Such events may be recognized perceptually by means of evident organizational interactions (e.g. the migration of people or relocation of settlements). Events may also be viewed as a process, taking into consideration the temporal and spatial aspects of the variations and interval of action used to bring the system to equilibrium. Through these events, the system-environment interaction maintains a steady state. Therefore, to minimize the stress, the living organisms act by means of a series of events. The higher the number of alternatives for responses, the better the chances to reduce stressful states.

---

<sup>1</sup>R. Knowles, *Owens Valley Study: A Natural Ecological Framework For Settlement*, Los Angeles: University of Southern California, 1969, (esp. pp. 5-16).

Since the purpose here has been to point out the various conceptualizations by different researchers who have dealt with stress phenomena, no attempt has been made to analyze the individual definitions. The primary intention in this short summary has been to point out concisely the state of the field for the specific purposes of this study. Furthermore, there are numerous reviews which analyze these different models at some length.<sup>1</sup>

At this point, before the various environmental considerations are explored, it suffices to give the definitions of the key concepts without any elaboration. Elaboration on these definitions will be attempted in the conceptualization of the environmental stress model later on. The three key concepts that need definitions are environmental load (force, demand), environmental stress, and environmental strain. *Environmental load* is any input that has the capacity to be a threat to the maintenance of a system, to its range of stable equilibrium, harmony or adaptiveness, and which threatens the achievement of a state to which some process is directed. *Environmental stress* is a state which occurs when the individual is subjected to environmental load(s). *Environmental strain* is the result

---

<sup>1</sup>For example, see: R. Scott and A. Howard, Models of Stress, in S. Levine and N.A. Scöth (ed.s), *Social Stress*, Chicago: Aldine Pub. Co., 1970, pp. 259-278; also, D.H. Carson and B.L. Driver, "An Environmental Approach to Human Stress and Well-Being: With Implications for Planning," *Mental Res. Inst.*, University of Michigan, *Preprint 194*, Ann Arbor, June 1970; at the end of the fifth chapter, Settings, Measures, and Themes: An Integrative Review of Some Research in Social Psychological Factors In Stress; by J.E. McGrath in J.E. McGrath (ed.), *Social and Psychological Factors in Stress*, New York: Holt, Rinehart and Winston, Inc., 1970, there is also an extensive bibliography; see: pp. 84-96.

of stress and the ineffective coping with a particular load.

*Summary*

-Housing is a complex process in which the corporate process must be viewed not in terms of separate components but in terms of their interconnections. The concept of *stress* is introduced to form a link between the different but related disciplines (e.g. physiology, psychology, sociology, architecture, etc.) and the housing design process.

-A brief review of the use of *stress* shows that there are fundamentally two definitions of stress: one emphasizes the stimulus condition and the second is based upon both stimuli and responses.

-Three key concepts to this study are defined: *environmental load*-an input which poses a threat to the desired level of maintenance of a system; *environmental stress*-a state that arises after being introduced to environmental loads; *environmental strain*-a disturbance which results from a stress state if coping is unsuccessful. The cognitive factors in the coping process include environmental elements.

## Chapter Three

## ENVIRONMENTAL CONSIDERATIONS

## ENVIRONMENTAL INFLUENCES

Human physiological behavior, in any environmental context, manifests the characteristics of larger ecological systems. That is, it exhibits the following four essential properties of the ecological systems: *systems* property, *historical* quality, *spatial* interrelationship, and *non-linear* structural properties.<sup>1</sup> The multi-component structures and the complex feedback interactions among them characterize the *systems* property of physiological behavior. *Historical* quality exists due to the fact that sensory responses are not merely the result of immediate situations but are also the result of past events and their relationships with the present situations. These responses are due to different environmental events which occur in more than one location in space. Physiological behavior is thus operating within a *spatial* interrelationship. *Non-linear* structural property is due to the fact that physiological behavior is not directly proportional to an environmental force. For instance, the temperature can be too warm or too cold for human comfort, just as the precipitation may be overabundant or too little for optimum plant growth. Furthermore, there is more to the physiological response than just a

---

<sup>1</sup> C.S. Holling and M.A. Goldberg, Ecology and Planning, *AIP Journ.*, v.37, n.4, 1971, pp. 221-230.

stable equilibrium condition under a given situation. There are boundary limits, discontinuities, thresholds and lags.

It should be emphasized that physiological behavior is not exclusively due to the physical parameters of environmental disturbances.

Cognitive factors, as well as the physical parameters, are the major determinants of adverse aftereffects of exposure to environmental disturbances. It is now widely accepted that the central nervous system and its receptors are easily acted upon under certain conditions by these environmental factors that ordinarily do not otherwise affect the organism.<sup>1</sup> Therefore, the influence of these environmental factors is not merely physiological but psychological as well.

The interdependent actions of the four characteristics of physiological behavior mentioned earlier, produce an internal resilience and stability. It is within this range that a form of adaptation to adverse events develops. According to Glass and Singer this adaptation is a response to disturbances acting upon the internal or the organism-environment equilibrium.<sup>2</sup> Therefore, efforts by the individual to reduce stress through the cognitive appraisal process is one form of adaptation. Efforts by the organism to reduce stress in order to survive and function in that particular environmental condition is another form of adaptation. However, an organism's adaptation to

---

<sup>1</sup>M.S. Gorosov, *The Physiological Basis of Health Standards for Dwellings*, Geneva: World Health Organization, Public Health Papers No.33, 1968, pp. 77-80.

<sup>2</sup>D.C. Glass and J.E. Singer, *Urban Stress: Experiments on Noise and Social Stressors*, New York: Academic Press, 1972, pp. 7-12.



environmental changes is not effected by permitting larger changes in the biological systems to occur, but basically by increasing the capacity of the system to cope with the effects of external demands. Although these diverse forms of adaptation can be performed by automatic physiological mechanisms (e.g. thermoregulation mechanisms of the body irrespective of the climatic conditions;<sup>1</sup> clothing; passive or active environmental control mechanisms, such as careful design considerations and planning, mechanical equipment, etc.), adverse aftereffects are inevitable when the adjustive capacities are overtaxed. This is to say that adaptation occurs only within the limits of stability.

Therefore, the upper and lower boundaries that mark the domain of stability are the measures of resilience in which successful adaptation may take place. The adaptation process is neither static nor uniform. There is a continuing adaptation process with changing stability conditions as the biological and psychological needs of an individual, as well as the external environmental demands that he is exposed to, are constantly changing. Depending upon the systems, there is even the possibility of boundary shifts.

Examples will serve to illustrate the events more clearly. One of the physiological criteria for body comfort is thermo-regulation. The body temperature of a healthy person has a rather narrow range of resilience. For instance, while the skin temperature has a range of  $28^{\circ}\text{C} \pm 15^{\circ}\text{C}$ , the range for the rectal temperature is usually  $37^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$ .

---

<sup>1</sup> These may be skin and capillary vein contraction, shivering, etc. under cold environmental conditions or expansion of arteries and veins, acceleration of pumping blood for rapid cooling, rise in sweat glands production, etc. under hot environmental conditions.

When the external environmental conditions show variation, through heat loss or heat gain, the body can regulate its own temperature and functions with no aftereffects noticed by a healthy person. However, when the external conditions are beyond the adaptive capacity of the body (e.g.  $40^{\circ}\text{C}$ ), i.e. when the limits of the zone of indifferent metabolism is overtaxed, the body reacts inadequately, resulting in somatic malfunctioning and strain.

This can be illustrated graphically as in Figure 3.1 where the ordinate (Q - any quantity to be measured) represents the body temperature. Then the stable equilibrium line will correspond to  $37^{\circ}\text{C}$  or  $28^{\circ}\text{C}$  and the upper and lower boundaries will be  $0.5^{\circ}\text{C}$  or  $15^{\circ}\text{C}$  for the rectal and skin temperatures respectively. When the stability is forced beyond the distinct boundaries due to severe external temperatures, then the regulating mechanism fails to cope with the stress situation and leads to a strain.

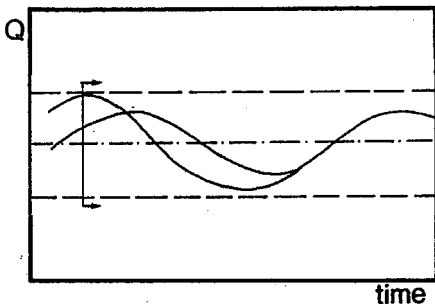


Figure 3.1  
 STABLE LIMIT CYCLE  
 Adopted from Holling and Goldberg (1974).

Another instance of this occurs when the boundaries and the equilibrium points are shifting and changing over a period of time. In the past twenty-five years the loudest noises in the urban environments have increased 25 decibels--from 110 dB(A) to 135 dB(A).<sup>1</sup> On the other hand tests and experiments indicate that long-time exposure to increasing noises shifts the threshold of normal hearing.<sup>2</sup> This does not however, suggest that adaptability is limitless. This case is shown in Figure 3.2 where the ordinate represents the sound level.

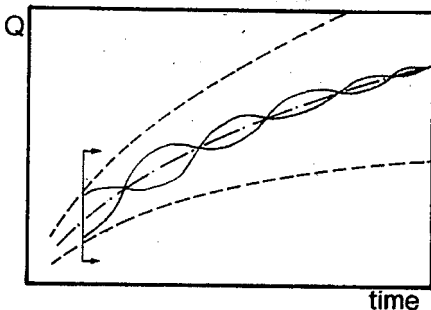


Figure 3.2  
 STABLE TRAJECTORY  
 Adopted from Holling and Goldberg (1971).

<sup>1</sup>H.C. Branch, et al., *Outdoor Noise and the Metropolitan Environment: Case Study of Los Angeles with Special Reference to Aircraft*, Los Angeles: Department of City Planning, 1970.

<sup>2</sup>K.D. Kryter, Exposure to Steady-State Noise and Impairment of Hearing, *Journ. Acoust. Soc. Am.*, v.35, n.10, 1963, pp. 1515-1525.

Man's ability to adapt has allowed him to cope with environmental conditions that otherwise may be detrimental to his health. However, this ability to tolerate certain environmental predicaments may create a false sense of well-being. Investigations of isolated phenomena pertaining to specific environmental demands may not show severe aftereffects but the combination of several factors may very well produce undesired effects. Physically there may be very little adaptation required by the human body but the mental processes involved in adaptation may produce cumulative effects that can cause unpredictable and undesirable consequences. One particular environmental force (e.g. odor, *per se*) may not impair a simple activity because of adaptation brought about by means of the stress responses. However, the introduction of cognitive factors, for example the awareness of a lack of control over environmental forces, can burden the individual with strain over the failure in both the coping process and the task or activity in which he has been indulging.

It should be noted at this point that environmental stresses are not necessarily additive.<sup>1</sup> The Gestalt characteristic, or more

---

<sup>1</sup> It is also true that some researchers, e.g. R.E. Munn, *Biometeorological Methods*, New York: Academic Press, 1970, pp. 193-201; C.E. Wyndham, *Adaptation to Heat and Cold*, in D.H.K. Lee and D. Minard (ed.s), *Physiology, Environment, and Man*, New York: Academic Press, 1970, pp. 177-204; D.H.K. Lee and A. Henschel, "Evaluation of Thermal Environment in Shelters," U.S. Dept. of Health Education, and Welfare, Div. Occupational Health, TR-8, 1963, have treated the problem of stress within the scope of energy expenditure, assuming that responses can be additive. That is, situations which require more than a moderate rate of energy expenditure are considered as being stressful. This type of treatment is used for quantification and an easier exhibition of such states. Nevertheless, as D.E. Broadbent (The Work of the Allied Psychology Research Unit, Forward, *Human Performance Report List*, 9, p. 5, Cambridge, England, Autumn, 1963), queried a decade ago, the question "Are effects of different stresses multiplicative, additive, or do they perhaps even cancel each other?," still remains to be answered.

specifically the synergistic response, in which the cooperative action of discrete stresses is greater than the sum of the effects taken independently is one type of response. On the other hand, there are cases in which the response may be antagonistic (or competitive) with a reduction in the total response.<sup>1</sup>

Fundamentally, adaptation and the environmental stress relationship may be exhibited by a deficiency in the satisfaction of primary (viscerogenic) and secondary (psychogenic) needs.<sup>2</sup> Some of these needs can be manifest (overt) and others can be latent (covert). While primary needs demonstrate more of a manifest nature, secondary needs tend to be inhibited by the individual. While the former require particular environmental conditions, the latter tend to express themselves in a wide variety of situations and environmental conditions. Stress situations occurring due to primary needs may be exhibited by the reactions to the organic requirements that are essential for physical survival. Exhibition and measurement of stress situations as a result of the secondary needs are more complex and enigmatic since these involve threats to the self-esteem of the person, which is more ambiguous than the demands or threats which act upon the biological organism. Within the hierarchy of needs, as we climb up the phylogenetic scale, the exhibition of stress situations becomes more obscure for the reason that "stress reactions become less dependent on the direct impact of stimuli and more contingent on associated cues that signify

---

<sup>1</sup>R. E. Munn, *Biometeorological Methods*, p. 6.

<sup>2</sup>H. A. Murray, et al., *Explorations in Personality*, New York: Oxford University Press, 1938, pp. 76-85.

the implications and consequences of these stimuli."<sup>1</sup> Stresses resulting from secondary needs have been mainly exhibited by the annoyance and displeasure of the individuals, and by the disruption of task performance or other behavior.

#### *Thermal Environment*

The stresses that result due to thermal environment are fundamentally functions of the radiant and ambient air temperatures, the moisture content of the air, and the air movement which in return affect the radiation, convection, evaporation and conduction rate of the body. Consequently, the conditions favorable to appropriate thermal comfort in a dwelling are highly dependent upon the general climatic conditions, the planning and lay out of inhabited areas, the design and construction of dwellings, and some other factors that influence the internal microclimate.

Although stress situations resulting from thermal conditions may not be severe enough to threaten the organism dramatically, the strains they can produce may result in an annoyance or discomfort level, especially in a housing environment. Thermal stresses may not completely impair a task performance but may adversely influence a person's thermal condition as well as his sense of well-being.

Even though the thermoregulatory mechanism of the human body is efficient in coping with different environmental demands and in establishing an equilibrium with the external environment, the prolonged and excessive use of the cortically regulated reactions does not imply that they will indefinitely provide optimum conditions for

---

<sup>1</sup>Glass and Singer, *Urban Stress*, p. 6.

the organism. Studies in this line show evidences of undesirable physiological changes that frequently lead to pathological effects.<sup>1</sup> Stress-situations that lead to a lesser degree of discomfort are more common. Thermal discomforts that may result from excessive air motion and air stratification,<sup>2</sup> clothing factors in different psychometric conditions,<sup>3</sup> task interference<sup>4</sup> and others are some of the examples of this type of strain.

The combined effects of environmental factors (particularly thermal factors that affect the human body simultaneously) have been studied for a long time and consequently this has led to the defining of a zone of thermal comfort. This zone is conceived of as a set of environmental (thermal, in this case) conditions under which minimal demands are made upon the human thermoregulatory mechanism. Although this zone of thermal comfort is quite uncertain, since it varies with age, type of activity, clothing, state of health, metabolism rate and so forth, the range is sufficiently broad to be valid. Within this rather flexible range of indices the individual is both objectively and subjectively comfortable.

There is no real criterion by which comfort can be precisely

---

<sup>1</sup>J. Aronin, *Climate and Architecture*, New York: Reinhold, 1943; C.S. Leithead and A.R. Lind, *Heat Stress and Heat Disorders*, Philadelphia: F.A. Davis Co., 1964, (esp. pp. 195-226).

<sup>2</sup>W.H. Severns and J.R. Fellows, *Air Conditioning and Refrigeration*, New York: John Wiley and Sons, 1958, pp. 44-56.

<sup>3</sup>T. Inouye, et al., Comparison of Physiological Adjustments of Clothed Women and Men to Sudden Changes in Environment, *Heating, Piping and Air Conditioning*, v.25, n.5, 1953, pp. 125-130; F.N. Craig and E.G. Cummings, Thermal Influence of Sunshine and Clothing on Men Walking in Humid Heat, *Journ. Appl. Physiol.*, v.17, n.2, 1962, pp. 311-316.

<sup>4</sup>R.D. Pepler, Warmth and Performance: An Investigation in the Tropics, *Ergonomics*, v.2, n.1, 1958, pp. 63-86.

evaluated.<sup>1</sup> Perhaps the best way to define a comfortable condition is that of a situation in which discomforting and irritating feelings do not exist. A comfort zone which has been used and improved considerably, especially in the last decade, is still not sufficient to be accepted as an absolute set of standards. Although boundaries have been set, there are likely to be situations of stress. These could be conditions that are near these boundaries at points away from the center of thermal neutrality. Even though the strain that results from these stresses is not significantly detrimental, exposure to the edge conditions for extended periods of time is not recommended.<sup>2</sup>

In *Man, Climate and Architecture*, Givoni warns us not to confuse thermal comfort with thermal balance.<sup>3</sup> Admittedly, thermal balance is a necessary condition for comfort. Nevertheless, it can also be achieved under uncomfortable conditions since it is dependent on the functioning of the thermoregulatory mechanism. As long as this activation of the thermoregulatory mechanism is within the boundaries of stability, that is within the limits of the system's resilience, the possibility of stress occurrence is slight. Yet attainment of the thermal balance does not necessarily mean that comfortable conditions have been reached.

This point becomes even more important in the psychological assessment of the thermal conditions. Subjective sensory responses depend mainly upon the self-evaluation of the individual and they are not unequivocal

---

<sup>1</sup>v. Olgyay, *Design With Climate*, Princeton, N.J.: Princeton University Press, 1963, p. 18.

<sup>2</sup>*Ibid.*

<sup>3</sup>B. Givoni, *Man, Climate, and Architecture*, New York: Elsevier, 1969, p. 47.



as they may be in the evaluation of physiological responses. Consequently, the interpretation by the designer of the comfort zone as the absolute standard provides no flexibility for the inhabitant. This lack of controllability on the inhabitants part may lead to stressful situations under different circumstances.

Maintaining an environment within the limits of the thermal comfort zone does not imply constant, non-changing thermal conditions. The invigorating effect of slight fluctuations in thermal conditions of enclosed spaces (especially in the air movement) is a common experience to everyone. In addition to preventing the feeling of monotony, the slight fluctuations in the indoor climate improve the effectiveness of vascular response to thermal stimuli.<sup>1</sup> Therefore, the provision for slight fluctuations can be viewed as a stress reducing tool both at the physiological and the psychological levels. Ackerman's study of a classroom situation demonstrates this aspect rather convincingly.<sup>2</sup> According to this study, students were able to work better under programmed fluctuations of an indoor climate than in a thermal environment that was kept constantly at a precise level.

The psychological features of exposure to extreme thermal conditions manifest themselves in behavioral changes. The indices of the strains resulting from the thermal forces may be found in the form of aggression, hysteria or apathy. It is also noted that this may take the form of

---

<sup>1</sup>Goromosov, *The Physiological Basis...*, p. 27.

<sup>2</sup>J. Ackerman, "Indoor Climate Seminar on Human Biometeorology," U.S. Dept. of Health, Education, and Welfare, Public Health Serv. Publ. 999-AP-25, Wash., D.C., 1967, pp. 133-144.

mild psychoneurosis.<sup>1</sup> Admittedly, there are very few cases of true psychotic reactions. Nevertheless, the usual disturbances, as mild as they may be, have to be taken into account when one is concerned with the total sense of well-being of the individual.

Although acclimatization can be achieved without severe discomfort, the possibility of strain which the individual develops is not ruled out.<sup>2</sup> This is true for both temporary and chronic exposures to thermal forces. Of course, the directness of these stresses still remains a very difficult problem. That is, due to the complexity of human behavior it is not certain whether the thermal stresses are what specifically bring out the underlying psychopathological patterns in the individual or whether similar reactions would come out under other types of stress such as sensory deprivations, fatigue, sleep deprivation etc.

In normal housing situations the threats resulting from thermal stresses are not as severe as some of the studies, which were conducted under extreme conditions, have indicated. Studies conducted to measure the effect of thermal stresses on the performance levels of mental and physical tasks are more applicable to housing situations than the studies that are conducted in severe thermal conditions. The general consensus of these types of studies is that a considerable deterioration is evident in all the tasks at temperatures between 28°-30°C.<sup>3</sup> The

---

<sup>1</sup>Wyndham, *Adaptation to Heat and Cold*, p. 192.

<sup>2</sup>P.F. Iampietro and R.F. Goldman, *Tolerance of Man Working in Hot, Humid Environments*, *Journ. Appl. Physiol.*, v.20, n.1, 1965, pp. 73-76.

<sup>3</sup>N.H. Mackworth, *Researches on the Measurement of Human Performance*, Med. Res. Conv. Spec. Rep. No. 268, London: H.M.S.O., 1950; R.D. Pepler, *Warmth, Glare and a Background of Quiet Speech: A Comparison of Their Effects on Performance*, *Ergonomics*, v.3, n.1, 1960, pp. 68-73;

tasks in which the performance levels were studied range from simple ones, such as the controlling of small mechanical operations, to more complicated ones, such as coding messages. The variety and nature of these experiments are compatible with the housing situations since very similar types of work take place in the daily activity of a household, such as: housewives operating anything from washing machines to mixers, children doing schoolwork ranging from mental multiplication to concentrated reading of more complex material, etc. Any type of low achievement on task performance or any damaging mistakes that may be a result of the thermal stress may not be severe enough to have apparent manifestations but the possibility of strain, especially the accumulation of strains, is a psychological burden which affects the well-being of the individual.

These thermal stresses are definitely not isolated from the other influences acting upon the individual. Social and cultural stresses at a general level and stresses due to monotony, boredom, etc. at a more specific level, are only some of the many forces that act upon people. In other words, the totality of the personality structure is under the influence of environmental demands. Hence, the individual differences, socio-cultural makeup, the level of adaptation and so forth, contribute a significant amount to the coping process of each individual. Under similar environmental conditions the elderly may require higher temperatures,<sup>1</sup> the ethno-cultural differences may make one group

---

I.J. Grieve, *Thermal Stress in a Single Storey Factory*, *Ergonomics*, v.3, n.4, 1960, pp. 297-306; J.K. Page, *Human Thermal Comfort*, *Architects' Journ.*, v.137, n.25, 1963, pp. 1301-1308.

<sup>1</sup>F. Meyer, *Housing the Elderly*, *Air Conditioning, Heating and Ventilating*, v.59, n.3, 1962, pp. 50-54.

more aggressive,<sup>1</sup> and the higher metabolism rate in some groups may require less clothing and lower indoor temperatures.<sup>2</sup>

These and other evidences, though not conclusive, are convincing enough to emphasize the importance of the total control over the thermal environment by the individual or individuals. A study, conducted in England, in which tenants' reactions to different methods of controlling the various heating systems were studied, affirms the necessity of the regulation of the thermal environment by the individual.<sup>3</sup> This becomes even more significant and essential today because of the wide application of mass-produced and high density housing.

Individual control does not mean merely the control of the mechanics of the heating-cooling system. The design process should provide more controls of a *passive nature* (i.e. controls that emerge out of design considerations such as orientation, materials, the placing and size of openings, etc.) rather than controls of an *active nature* (i.e. controls of the mechanical system). This is not only important in order to reduce the alienation of man from his immediate surroundings but also for ecological purposes. Indeed, the modern mechanical

---

<sup>1</sup>J.S. de Ridder, *The Personality of Urban Bantu and its Tribal Roots, Mine Medical Officers Assoc., Proceedings S. Africa*, V.65, 1965, 52 f., cited by C.E. Wyndham, *Adaptation to Heat and Cold*, p. 190; J.A. Hildes, *Ecologic and Ethnic Adaptations*, in D.H.K. Lee and D. Minard (ed.s), *Physiology, Environment, and Man*, New York: Academic Press, 1970, pp. 149-154.

<sup>2</sup>O.G. Edholm, *Problems of Acclimatization in Man, Weather*, v.21, 1966, pp. 340-350.

<sup>3</sup>E.A. Milroy and G.A. Atkinson, *Heating for High Density Housing: A Guide to Modern Methods in Use*, Building Research Current Papers. Design Series No. 26, 1964.

systems are sufficiently capable of coping with the external thermal demands. However, it has been shown that some favorable indoor conditions may also be attained by simpler measures through inherent design considerations.<sup>1</sup> Passive controls not only help to reduce the stress situations that can become a physical threat, especially to the urban environments, but they also cut down considerably on the maintenance expenditure of the active systems which are usually causing other types of stresses.<sup>2</sup>

The total dependence upon modern methods of technology in controlling indoor climate has influenced the development of two different but highly related problems. First, the enclosed environment becomes almost a machine to live in at the risk of multi-sided stress situations that the individual has to cope with constantly. These states of stress manifest themselves both on the physiological and psychological levels.

---

<sup>1</sup> M. Turan, "Environmental Influences on the Evolution of Housing in Hot-Arid and Marine-Cool Regions in the Pre-Industrial Period," College of Architecture, University of North Carolina at Charlotte, October 1972, (Mimeographed).

<sup>2</sup>Energy utilized in heating and cooling homes in the United States, for example, consumes almost as much energy as all of the industries do. The statistics of 1967 indicate that almost one-third of the total energy consumption is taken by homes. An average home requires approximately the same amount of energy used by the average family car (about 17.5 million kcal/yr. (70 million BTU/yr.), or the equivalent of 900 gallons of oil). The waste heat that is released to the external environment from space heating is about 10 million tons, which is approximately half of that of the industries. It is also apparent that the "heat island" phenomenon in urban areas is not only due partially to this waste from the homes but it also contributes to more energy expenditure in the homes. See: S.F. Singer, Human Energy Production as a Process in the Biosphere, in A Scientific American Book, *The Biosphere*, San Francisco: W.H. Freeman and Co., 1970, pp. 105-114; also: J.T. Peterson, Climate of the City, in T.R. Detwyler (ed.), *Man's Impact on Environment*, New York: McGraw-Hill Book Co., 1971, pp. 131-154; W.P. Lowry, The Climate of Cities, *Scientific American*, v.217, n.2, 1967, pp. 15-23.

The inhabitant is left powerless and without having any effect over the environment. The lack of controllability and the presence of monotonous feelings, as well as other devastating effects within today's dwellings are all partially the results of the design and construction deficiencies.

The second problem, partially generated by the substitution of only technological measures for conditions which require real design considerations, is of a bigger and more physical nature. This problem is easier to recognize because of its scope and overtness. The high energy-consumption type of maintenance in all seasons makes today's dwellings one of the major contributors to the heat island effects that are experienced in most of the urban areas.

#### *Atmospheric and Olfactory Environment*

In a housing environment the stress states which arise due to atmospheric reasons are primarily the functions of the intensity of odors and irritants, such as dust, smoke and fumes, and the contamination level in the air contributed by gases and airborne bacteria. Impurities in the indoor atmosphere and the deterioration in the physicochemical properties of the air lead to adverse physiological and psychological effects on the inhabitants. The strains caused by these undesirable properties of indoor air may not be as threatening as those caused by the high concentration of air pollutants found outdoors, especially in the urban areas. Nevertheless, this is a discomforting situation. Repulsiveness and unsavoriness of an obnoxious odor in insufficiently ventilated rooms may even cause feelings of oppression. As a result of these strains, the ability to work is reduced, and rest and relaxation is disrupted.

While an excess amount of carbon dioxide, resulting from metabolic processes, can increase the respiration rate, and in so doing thrust an additional load on the respiratory system, highly toxic carbon monoxide can produce more adverse effects on cognitive ability and psychomotor functioning.<sup>1</sup> In dwellings the principal sources for these gases are the devices used for domestic purposes, such as heating and cooling. Among the air pollutants which can cause strain are sulfuric gases. A sufficient concentration of sulfur dioxide, for instance, can lead to respiratory irritation.<sup>2</sup> This gas can also reduce normal visibility and cause eye irritations.<sup>3</sup> Sulfuric gases may be generated by the accumulation of urine from dogs and cats.<sup>4</sup> This is a likely source in today's high-rise dwellings where pets are allowed.

Although the majority of air-borne bacteria are non-pathogenic and relatively harmless, they are however potential sources for physiological strain. They attach themselves to dust particles and settle upon most surrounding surfaces in the immediate environment. Later on, a disturbance of these surfaces will cause the bacteria to disperse into the air. Therefore, the presence of dust within enclosed spaces also means the existence of bacterial organisms. The total

---

<sup>1</sup>Goromosov, *The Physiological Basis...*, pp. 40-43.

<sup>2</sup>H. Heimann, *Air Pollution and Respiratory Disease*, U.S. Dept. of Health, Education, and Welfare. PHS Div. of Air Poll., PHS Publ. No. 1257, Washington: U.S. Government Printing Office, 1964.

<sup>3</sup>J. Harkins and S.W. Nicksie, Studies on the Role of Sulfure Dioxide in Visibility Reduction, *Journ. of Air Pollution Control Association*, v.15, n.5, 1965, pp. 218-221.

<sup>4</sup>W. Summer, Ultra-Violet Deodorisation of Air, *Instn. Heating and Ventilating Engrs. Journ.*, v.19, n.195, 1951, pp. 327-350.

elimination of all bacteria is almost impossible since there is a continuous contamination from the occupants.

Nature has its own ways (e.g. precipitation, ultra violet radiation, filtering through vegetation, etc.) of reducing the bacteria suspended in the outside air thus maintaining a certain balance.<sup>1</sup> On the other hand, the design of indoor spaces does not generally provide any of these natural amenities, due to both impracticality and often sheer negligence. The excessive dilution of the infected open air and the germicidal effect of sunlight reduce the bacteria almost to a negligible level.<sup>2</sup> Whereas, micro-organisms found indoors reveal the fact that enclosed, non-ventilated spaces have bacteria suspended in the air at a level 8.3 times that of the outdoor air, and, ventilated, enclosed spaces have bacteria at a level 4.6 times that of outdoor air.<sup>3</sup> Another study showed the bacterial counts in a diningroom and in a bedroom to be 620 per cu. m. (65 per cu. ft.) and 1425 per cu. m. (150 per cu. ft.), respectively.<sup>4</sup>

The reduction of communicable diseases caused by air-born bacteria can be achieved by means of passive and active design controls. Passive controls include: proper ventilation (to dilute the indoor infection by using excessive amounts of outside air); providing the penetration of direct sunlight. Active controls include: ventilation

---

<sup>1</sup>J.M. Fitch, *American Building: The Environmental Forces that Shaped It*. 2nd ed. rev.; Boston: Houghton Mifflin Co., 1972, p. 62.

<sup>2</sup>W.F. Wells, Sanitary Ventilation, *Am. Journ. Pub. Health*, v.38, 1948, pp. 775-780.

<sup>3</sup>R.L. Kuehner, Bacteria and Odor Control Problem in Occupied Spaces, *Heating, Piping and Air Conditioning*, v.24, n.12, 1952, pp. 113-119.

<sup>4</sup>Summer, Ultra-Violet Deodorisation of Air.



by mechanical means; employing special lamps to compensate for environmental deficiency in ultra-violet radiation; the use of chemical vapors; precipitation (electrostatic precipitation and the filtering of dust particles from the circulated air); the application of high temperatures (heat) to the indoor air. Some of the active controls may not be economically feasible or practical for application in today's dwellings. However, their use may be required in areas where purer indoor atmospheres are very critical (e.g. libraries, hospitals, laboratories, computer banks, etc.). The employment of mechanical equipment does, however, have some adverse consequences.<sup>1</sup> The waste material that these mechanical controls put out into the external environment in significant amounts is another atmospheric load that must be coped with, physically, physiologically and psychologically.

The presence of odors caused by domestic activities and by the occupants (body odors) may also lead to stressful states. Summer classifies odors according to their sources and by subjective descriptions of them: 1. foul odors--a) faecal, b) caprylic, c) fishy, d) garlic, e) sulfuric; 2. pungent odors--ammoniacal; 3. repulsive odors; 4. burning odors.<sup>2</sup> The sources for foul odors are usually the bathroom and the kitchen. Odors of a caprylic and sulfuric nature may be due to pets being kept indoors. Pungent odors may be generated by negligence in the kitchen (e.g. rotten fish or meat) or by the human body itself. Some plants and bed-bugs give rise to repulsive odors while burning odors arise from tobacco being

---

<sup>1</sup>R. J. Hutcheon, *et al.*, Observation of the Urban Heat Island In a Small City, *Bull. Am. Meteorological Soc.*, v.48, n.1, 1967, pp. 7-9.

<sup>2</sup>Summer, Ultra-Violet Deodorisation of Air.

smoked in a housing environment.

Odor control is integral with psychometric control. While extreme temperatures may slightly reduce the ability to perceive odor, both high and low humidity reduce the activity of the sense of smell. For example, cooking and smoking generate an odor that is independent of the humidity in a room. A high relative humidity is desirable to lower the sense of smell.<sup>1</sup> However, with odors arising from linoleum, paint and upholstery where the source of smell is intrinsic, a lower relative humidity is advantageous. Ventilation, or the replacement of the air within an enclosed place with air from outside, has a direct positive effect on the reduction of odors. Therefore, air velocity and circulation, within a room, have great significance in the coping with stress situations which arise from odorants.

The sensation of freshness, as opposed to the feeling of stuffiness, is fundamentally created by the variability of air movement. It is, nevertheless, integral with the other psychometric controls such as air temperature and humidity. Basically, the sensation of freshness is a stimulation experienced by the exposed skin and nasal passages of the individual. The lack of this stimulation leads to the stagnant and musty air which creates an impression of stuffiness. While more general design features such as the location of the kitchen in relation to the rest of the living quarters do have great influence on the quality of the air in an apartment, the specific design considerations, such as the number of windows and their distribution in a room, are important as well. Although there are recommended minimum standards

---

<sup>1</sup>R.L. Kuehner, Humidity Effects on the Odor Problem, *Heat, Piping and Air Conditioning*, v.27, n.9, 1955, pp. 155-158.

for the frequency of air replacement, calculations indicate that most of the rooms (especially those with windows on only one wall) do not meet the criteria set by these standards.<sup>1</sup>

Nausea, headaches and adverse effects on respiration are some of the more common physiological reactions to odors.<sup>2</sup> Psychologically the importance of olfaction lies in the following reasons: a) olfaction is one way for the organism to make contact with the environment and learn to discriminate among the significant aspects of the surroundings, b) olfaction assists the organism to acquire an aesthetic reference of the immediate environment.<sup>3</sup> The psychological adverse effects are accelerated as the concentration or the intensity of the odor is increased. Although investigations show that olfactory adaptations (e.g. sensory detection, energy difference that an observer can detect) are relatively short, they also confirm that the hedonic range for different odorants is very large and the olfactory system has a remarkable ability to analyze these diverse odorants.<sup>4</sup> Furthermore, the unpleasantness and the discomfort generated by the olfactory environment is more dependent upon the type of stimulation rather than the magnitude of the stimulation. Since the type of stimulation is assessed by the cognitive process, the impact of the information

---

<sup>1</sup>Goromoso, *The Physiological Basis...*, pp. 45-46.

<sup>2</sup>*Ibid.*, p. 44.

<sup>3</sup>E.J. Shoben, Jr., Some Observations on the Learning of Olfaction, *Am. Perfumes Cosm.*, v.78, n.6, 1963, pp. 44-46.

<sup>4</sup>T. Engen, Psychophysical Scaling of Odor Intensity and Quality, *Annals of the New York Academy of Sciences*, v.116, art.2, 1964, pp. 504-516; W.F. Kerka and C.M. Humphreys, Temperature and Humidity Effect on Odor Perception, *Am. Soc. Heat. and Vent. Eng. Trans.*, v.62, 1956, pp. 531-552.

overload (or underload) upon the perception system is likely to lead to strains if the individual cannot cope with the stress state. It appears that the efficacy of coping with the stress state, arising from the hedonic range, is a function of not only the intensity of the environmental force, but of an individual's appraisal of it. Contextual variables, such as controllability, predictability, and choice, associated with that particular environmental load, will affect the appraisal process.

#### *Sonic Environment*

The major factors leading to the stress state characterized by noise, are functions of many things: the type of noise (continuous or interrupted), the over-all level of noise, the spectrum of noise (low or high), total exposure duration, the condition of an individual's hearing mechanism and previous noise exposure(s). These factors lead to three fundamental adverse effects on man: 1) the temporary and permanent hearing loss, 2) interference with voice communication (speech disruption) and 3) changes in performance capacity. These effects may be accompanied by stress states of a psychological nature which may manifest themselves in the arousal of feelings of fear, apprehension, annoyance, dissatisfaction or auditory fatigue.

In the light of the parameters stated above, noise, then, can be defined as any sound that is physiologically stimulating and aversive, subjectively annoying and unwanted. The effect of noise is not a sensory motor effect but rather a perceptual one.<sup>1</sup> This perceptual

---

<sup>1</sup>D.E. Broadbent, *Perception and Communication*. New York: Pergamon Press, 1958, pp. 81-107.

characteristic adds to the complexity of the whole system in the sense that acoustical stress cannot really be isolated from the rest of the environmental stresses and analyzed independently. This phenomenon is basically due to the fact that non-auditory physiological and psychological responses to environmental noise essentially result from combined effects of specific behavior activities and noise, rather than noise *per se*.

Admittedly, the properties of acoustical energy (such as frequency, intensity, octave band, etc.) are very important in regard to stress. Nevertheless, the significance of the psychological dimensions of these properties (e.g. pitch, loudness, perceived noisiness, etc.) and other subjective evaluative criteria that affect one's auditory perception is equally important.

Although basic personality variables account for a large portion of the variance of noise effects, the properties of the noise itself are no less significant. The information and the meaning of the "unwanted" sound are primarily those properties of noise that influence the stress state. The nature of the information content and its load (overload or underload) is significantly important in the selection process of part of the information by the nervous system. According to Broadbent's theory, the capacity of the perception system is limited and hence the system filters out part of the information before reaching the sense organs.<sup>1</sup> Although the filter has a bias towards a novel event (it is this phenomenon that causes the disruption) it is also highly affected by the meaning of the noise. The impact of innate (structural) and

---

<sup>1</sup>Broadbent, *Perception and Communication*, (esp. pp. 40-45, 190-196, 251-256).

acquired aspects of the meaning of unwanted sound are mainly dependent upon the individual's past experience with that particular noise.

The acoustic forces which may lead to stress states, especially in a housing environment, are generally assessed by subjective reports of annoyance. The noises in dwellings are generally low-frequency sounds. Although they are low in intensity, prolonged exposure to them makes them one of the most common environmental forces with the potential of causing a stress state. Studies of reactions to moderate and low intensity sounds have demonstrated that long periods of exposure to certain sounds may lead to strains such as functional disturbances of the central nervous system.<sup>1</sup> These disturbances are exhibited in a variety of ways. They range anywhere from vasoconstriction to fatigue, from decrease in productivity to emotional effects. Among other factors affecting the degree of annoyance are such properties of sound as aperiodicity and unexpectedness. Studies of responses to the sound of aperiodic and unexpected nature suggest that stress situations generated by these types of noises have a more aversive impact on the individual.<sup>2</sup> This high rate of information that reaches the aural information channels causes more unpleasant and even deleterious effects than that caused by monotonous noises. This phenomenon is due mainly to a deficiency in the coping process.

---

<sup>1</sup>J.V. Grimaldi, Sensori-Motor Performance Under Varying Noise Conditions, *Ergonomics*, v.2, n.1, 1958, pp. 34-43; H.J. Jerison, Effects of Noise on Human Performance, *Journ. Appl. Psychol.*, v.43, n.2, 1959, pp. 96-101; A.F. Sanders, The Influence of Noise on Two Discrimination Tasks, *Ergonomics*, v.4, n.3, 1961, pp. 253-258; H.E. von Gierke, On Noise and Vibration Exposure Criteria, *Archives of Environmental Health*, v.11, September 1965, pp. 327-339.

<sup>2</sup>Sanders, The Influence of Noise... ; Broadbent, *Perception and Communication*.

Sonic stresses do not necessarily lead to a complete mental block or to a paralysis in some particular function. Instead they lead to milder cases of strains. The wandering of attention, slight signs of fatigue, irritation, distraction, etc. are only some of the aspects of general discomfort caused by stresses due to acoustical forces. These types of stresses are more relevant to the housing environment in which conditions for normal relaxation and simple tasks are disturbed. Milder cases of strain, of course, do not rule out the possibility that higher levels of sound may lead to strains of a more severe nature, such as nervous, psychic, cardio-vascular and other types of disorders.<sup>1</sup>

With the increasing mechanization and urbanization of society, the problem of noise is gaining more urgent attention. The problem of noise is due not only to industrial expansion but also to the changing pattern of daily life in which people, especially in the urban areas, cannot find rest and quiet even inside their dwellings. Insufficient protection against loud sounds, which come from either outside or inside the building, interferes with rest and sleep; causes fatigue, reduces task performance level and, in some cases, may even result in pathological reactions. Although there is behavioral and autonomic adaptation to noise, people nevertheless pay a psychic cost for the noise which surrounds them.

Certainly, there is a great difference between laboratory testing and

---

<sup>1</sup>K.D. Kryter, et al., Hazardous Exposure to Intermittent and Steady-State Noise, *Journ. Acoust. Soc. Am.*, v.39, n.3, 1966, pp. 451-464; R.C. Davis, A.M. Buchwald, and R.W. Frankman, Autonomic and Muscular Responses and Their Relation to Simple Stimuli, *Psychol. Monographs*, v.69, No. 405, 1955.

the real life situation, as Havel convincingly argues.<sup>1</sup> Nonetheless, this difference does not exclude the likelihood of equipotent reactions in both the housing environment and as observed in an experimental or artificial setting. Prolonged and repetitive exposures to noise at varying intensities does exist in dwellings. In the housing environment, there is also exposure to unpredictable noise as well as to high intensity sounds, no matter how short the duration. Although it is generally agreed that noise, *per se* contributes few deleterious consequences, its insidious character may lead to deeper physiological and psychological effects. An essential factor that should be considered is that noise is one of the environmental forces which people frequently encounter. Many studies have indicated that noise produces psychophysiological effects.<sup>2</sup> Other studies have pointed up the effects noise can have on task performance.<sup>3</sup> On the other hand, there are also comprehensive reviews of systematic research on noise which conclude that it is not directly harmful to people, nor does it interfere with psychomotor performance.<sup>4</sup> However, it has also been shown that strains develop after the sonic forces have been terminated.

---

<sup>1</sup>W. Havel, Personality, Situation, Activity, and Sound as Parameter of the Evaluation of Noise, in W. Taylor (ed.) *Proceedings of the Symposium on the Physioal Effects of Noise*, Cardiff, England, September 1967.

<sup>2</sup>K.D. Kryter, Exposure to Steady-State Noise and Impairment of Hearing, *Journ. Acoust. Soc. Am.*, v.35, n.10, 1963, pp. 1515-1525; C.G. Atherley, Noise as a Stress Phenomenon, in W. Taylor (ed.) *Proceedings of the Symposium on the Psychological Effects of Noise*. Cardiff, England, September 1967; D.E. Broadbent, Effects of Noises of High and Low Frequency on Behavior, *Ergonomics*, v.1, n.1, 1957, pp. 21-29.

<sup>3</sup>D.E. Broadbent, Effect of Noise on an 'Intellectual' Task, *Journ. Acoust. Soc. Amer.*, v.30, n.9, 1958, pp. 824-827; Jerison, Effects of Noise on Human Performance.

<sup>4</sup>K.D. Kryter, *The Effects of Noise on Man*. New York: Academic Press, 1970; Glass and Singer, *Urban Stress*, pp. 23-44.



In other words, the aftereffects appeared following the adaptive coping process.<sup>1</sup> These strains, developing as a combined result of the acoustical forces and the conditions of the cognitive overload, are basically the products of a noise of unpredictable and/or an uncontrollable nature.

The sources of noise in a housing environment are many and various. They can be classified into two categories: outside and inside sources. Among the sounds that penetrate into dwellings from the outside, or street, are those generated by transportation. The noise from vehicles may reach a level of 80-90 dB-A.<sup>2</sup> A number of surveys, conducted in various countries, have reported that there has been a continuous increase in the level of transportation noise.<sup>3</sup> This increase is also being supplemented by the sound of high-powered equipment (e.g. mowers which reach the level of 96 dB-A), airplanes, air-conditioners, etc. Besides these mechanical noises, there are other sounds which can be found outside the home, such as children's voices, the banging of trash cans, the barking of a dog, etc. These may be lower in intensity, but still they may be high enough to interfere with indoor activities and even cause some adverse effects.

---

<sup>1</sup>Glass and Singer, *Urban Stress*, p. 44.

<sup>2</sup>A. Cohen, J.R. Anticaglia, and H.H. Jones, Noise Induced Hearing Loss-Exposures to Steady-State Noise, *Proceedings of the Sixth Congress on Environmental Health*, Chicago (Am. Med. Assoc.), April 1969, Figure Y, p. 9.

<sup>3</sup>Branch, et al., *Outdoor Noise in the Metropolitan Environment*: See, also: Sir A. Wilson (Committee on the Problem of Noise), *Noise, Final Report*. London: HMSO, July, 1963. Wilson's study is very comprehensive on noise pollution as well as in the explanations of general effects of noise and noise in cities, buildings, etc.

The noises generated by indoor sources may not reach as high an intensity as those which come from the outside. However, studies have shown that noises of a low-intensity can be a disturbing factor.<sup>1</sup> Furthermore, some domestic noises may reach levels of 80-85 dB-A (e.g. the flushing of toilets in lavatories--80 dB-A; boiler furnace--82 dB-A; music on the radio--85 dB-A, etc.).<sup>2</sup> Noises which originate within the building, be it conversation, mechanical noises, or music, gain much greater volume and thus create more disturbance in a multi-family dwelling. Residents living in multi-family dwellings are very much aware of these "vicinal"<sup>3</sup> noises which may range from the sounds of normal conversation, a child's crying, to the slamming of doors.<sup>4</sup> It is the awareness, and consequently the disturbances caused by these penetrating noises, that is significant no matter what the physical measurement of the noises may be.

Karagodina has established a definite relationship between the noise intensity coming from within the multi-family dwellings and that coming from outside sources, both for the various construction types and plan lay-outs.<sup>5</sup> This study also reports on the complaints coming from the

---

<sup>1</sup>D.A. Laird and K. Coye, Psychological Measurements of Annoyance as Related to Pitch and Loudness, *Journ. Acoust. Soc. Am.*, v.1, 1929, pp. 159-163.

<sup>2</sup>Goromoso, *The Physiological Basis...*, p. 72.

<sup>3</sup>L. Kuper, Neighbor on the Hearth, in H.M. Proshansky, W.H. Ittelson, and L.G. Rivlin (ed.s) *Environmental Psychology: Man and His Physical Setting*. New York: Holt, Rinehart and Winston, 1970, p. 248.

<sup>4</sup>Goromoso, *The Physiological Basis...*, p. 72.

<sup>5</sup>I.L. Karagodina, Characteristics of Noise Levels Inside Apartments of Dwelling Houses in Moscow, *Gigiiena i Sanitaria*, v.24, n.12, 1959, pp. 7-11.

residents about the noises encountered in apartment houses. In a different study a "synthetic noise irritator" was used to observe and test the changes and functional disturbances of the higher nervous system in man.<sup>1</sup> Psychophysiological tests of motor-conditioned reflexes, motor activity during sleep, skin-galvanic reflexes and the differential noise threshold values suggest that the maximum permissible intensity of noise in rooms of an urban dwelling is approximately 35-37 phons (this value is about 35 dB-A at a frequency of 1000 Hz). The acceptable limits for noise during the night time is about 25 dB-A at a frequency of 1000 Hz. These values were measured for rooms having a normal amount of furnishings and having closed windows and doors.<sup>2</sup>

These values are of great importance in order to establish the minimal standards for building materials and to recommend a spatial organization with regard to acoustics. However, it is even more important to understand the association between the noise (especially the unpredictable noise) and the behavioral deficiency, as well as how these stress situations are coped with by the individuals. The comprehension of this phenomenon is critical since it is directly related to the man-environment interaction, not only in terms of the sonic environment, but the entire environment.

Among others, Glass and Singer have emphasized the vital importance of unpredictable and aperiodic noises.<sup>3</sup> The importance of intermittent

---

<sup>1</sup>P.R. Weinshtein, P.J. Leushin, and A.J. Shafir, *Physiological and Hygienic Background for Determining Maximum Permissible Noise Intensity in Multi-Story Apartment Houses, *Gigiens i Santaria*, v.25, n.3, 1960, pp. 23-29.*

<sup>2</sup>Goromosov, *The Physiological Basis...*, p. 74.

<sup>3</sup>Glass and Singer, *Urban Stress*, (esp. pp. 45-107).

noise lies not only in its deleterious effects but also in its resemblance to the noises that individuals encounter in housing environments. Although there may be some adaptation to this type of noise, the tolerance limits of adaptation are not broad enough to decrease task degradation. This is especially true when complex tasks<sup>1</sup> and tasks requiring long-term vigilance<sup>2</sup> are involved. Since these task operations involve cognitive processes, one of the characteristics of the developing stress is that of overloading. Noise, as an input to the organism, overloads the subject to such an extent that adequate information processing that concerns the task at hand is prevented from occurring. Furthermore, task degradation continues, especially with intermittent noises.<sup>3</sup> This phenomenon is attributed to the aperiodicity of the noise. The intensity of the strains, as a result of these types of sonic forces, indicates that unpredictability of the noise is an important factor in the coping process. That is to say, unpredictable noises cause more adverse strains than predictable ones.

Addressing themselves to the question of why there is a difference between strains produced by the predictable and unpredictable noises, Glass and Singer conducted experiments concerning controllability.<sup>4</sup> The results show a considerable decline in the levels of strain that are produced by the predictable noise. The explanation that the authors propose for the effects of perceived control is very much in line with

---

<sup>1</sup>Grimaldi, *Sensori-Motor Performance...*

<sup>2</sup>Broadbent, *Perception and Communication*, pp. 108-139.

<sup>3</sup>Glass and Singer, *Urban Stress*, pp. 45-59.

<sup>4</sup>*Ibid.*, pp. 61-86.

the *helplessness* and *competence* levels of an individual encountering a stress state, as mentioned earlier in this study. The ability to have control over the environment induces a sense of competence in the individual. Thus, *having control over the environmental forces, the individual's coping process becomes more successful in dealing with the threats that may lead to stress states.* The effectiveness of stress depends partially upon the individual's evaluation of the environmental forces along with his own ability to cope with them. Thus, the cognitive factors brought into play in the coping process depend a great deal on the controllability over the particular environment.

#### *Luminous Environment*

The luminous forces which lead to stress states are fundamentally functions of the illumination level (brightness), distribution, direction and color of light. The basic adverse effects that may result from a dysfunction of any of the above mentioned parameters include acuity deficiency, changes in the performance levels, discomfort and visual fatigue. Observations and studies have also shown that besides these subjective aftereffects of lighting conditions, there are more severe long-term physiological strains generating from illumination.<sup>1</sup> These physiological disorders may range from changes in the muscular tension to the malfunction of the adrenal gland.<sup>2</sup> Furthermore, Wurtman even argues that light is the second most important environmental input (after food) in controlling the biological

---

<sup>1</sup>H.L. Logan, The Relationship of Light to Health, *Illum. Engng.*, v.62, n.3, 1967, pp. 159-167.

<sup>2</sup>M. Luckiesh and F.K. Moss, A Correlation Between Illumination Intensity and Nervous Muscular Tension Resulting from Visual Effort, *Journ. Exper. Psychol.*, v.16, 1933, pp. 540-555.

rhythms and bodily functions.<sup>1</sup>

Stress states may occur as a result of either natural or artificial light sources. Too much or too little light intensity coming from these sources, modified by the other environmental factors such as the physical characteristics of natural objects and other things present in the immediate environment, will affect the ability of the eye to see. The process of vision is dependent not only upon the optical properties, that is, the ability of the eye to get a clear image, but is also dependent upon the psychophysical properties. These properties are fundamentally the relations between the image and its interpretation by the brain. The environmental aspects of these psychophysical properties are of interest to this particular study.

There are basically two areas of vision that the eye sees: a narrow area of sharp central vision (foveal vision) and a larger area of out-of-focus background (peripheral vision). Sensations of detail and color are included in the foveal vision, whereas brightness and mass are principally characteristic of peripheral vision. Foveal vision is cued by the information gained through peripheral vision. While concentration on a particular object may be taking place in the foveal area, the peripheral vision area is constantly searching and trying to identify any new information cues in the general orientation of the visual world. From this phenomenon of sensory behavior arise two aspects that are significant from the environmental point of view. First, the structural qualities of the environment, enhanced by the lighting conditions, help in the visual task of spatial orientation.

---

<sup>1</sup>R.J. Wurtman, Biological Implications of Artificial Illumination, *Illum. Engrng.*, v.63, n.10, 1968, pp. 523-528.

Second, the effect of lighting on the detailed central task vision is critical since the essential information points are defined and the accuracy of visual communication is assisted by lighting.

The imbalanced manipulation of these visual conditions is generally expressed by visual clutter and by glare. These two disturbing factors are analogous to "unwanted" noise in a sonic environment because they are the "unwanted" lights in the visual field.<sup>1</sup> The information reaching the eye, just as in the case of the auditory system, goes through a filtering process in which part of the information may be filtered out. The filtering capacity of the perceptual system is basically a function of adaptation and visual acuity of the eye. These psychophysical properties of the visual process are dependent on the immediate environmental conditions (visual field)--brightness, contrast and color. Any act of fixation, that is the combined effort of the eye and the brain to concentrate upon a particular object or part of the visual field, may be distracted by the environmental conditions.

The "unwanted" lights in the visual field can be viewed as overload or underload information that reaches the eye. In the case of overloading, meaningless or confusing spatial cues are the forces which act upon the visual and appraisal process. Impairment of vision may be due to uncomfortable and dazzling or even blinding effects in which unfavorable adaptation conditions are prevailing. Or, as mentioned above, environmental conditions may lead to strains of less magnitude.

---

<sup>1</sup> R.G. Hopkinson and J.B. Collins, *The Ergonomics of Lighting*, London: Macdonald and Co., 1970, p. 25.

While high brightness, which impinges like a novel event upon the filtering process, may distract attention (phototropism - an involuntary turning towards the direction of the light source),<sup>1</sup> emotional reactions, which are due to shifts from black and gray colors to bright ones, may cause interference in the intellectual functioning of the individual.<sup>2</sup> On the other hand, as a low contrast situation affects visual acuity, this distraction may result in other types of strains such as the wandering of attention, task interference, etc.<sup>3</sup>

Experiments and studies, which were conducted in order to investigate various aspects of the visual field, have established quite convincingly that a definite relationship exists between the luminance level and the visual performance. In attempts made to relate the artificial laboratory conditions to real situations and to make the laboratory data more comparable with practical experience, some studies even used simulators which enabled the researchers to establish "field factors".<sup>4</sup> Observation techniques have been developed to study the dependence of accurate recognition upon luminance contrast.<sup>5</sup> These

---

<sup>1</sup>R.G. Hopkinson and J. Longmore, Attention and Distraction in the Lighting of Workplaces, *Ergonomics*, v.2, n.4, 1959, pp. 321-333.

<sup>2</sup>F.E. Harris and R.E. Bills, Psychological Consideration of Color Selection, *The American School and Univ.*, v.25, 1953-54, pp. 157-160.

<sup>3</sup>H.R. Blackwell and O.M. Blackwell, The Effect of Illumination Quantity Upon the Performance of Different Visual Tasks, *Illum. Engng.*, v.63, n.4, 1968, pp. 143-150.

<sup>4</sup>H.R. Blackwell, Development and Use of a Quantitative Method for Specification of Interior Illumination Levels on the Basis of Performance Data, *Illum. Engng.*, v.54, n.6, 1959, pp. 317-353.

<sup>5</sup>R.M. Boynton and N.D. Miller, Visual Performance Under Conditions of Transient Adaptation, *Illum. Engng.*, v.58, n.8, 1963, pp. 541-550.



and many other studies convincingly argue that the upward changes of environmental luminance often result in an improvement in visual performance. However, there is still an ambiguity in determining a conclusive relationship between the visual field and the behavioral aftereffects, due to the complexity of the process. This uncertainty is due as much to the transitional adaptation as it is to individual differences. The varied characteristics of the everyday visual environment do not make the results of transitional adaptation studies easily and directly applicable to the designed environments.<sup>1</sup> Most of the established illumination standards are specified according to the size of the visual task and its contrast with the background brightness. Yet, it has also been shown that various qualitative aspects of artificially lit environments may lead to anomalous judgments. One study goes even further to question the validity of some of the values (e.g. the ratio of illumination of the task environment to the surrounding environment) recommended in the Illuminating Engineering Society (IES) code.<sup>2</sup>

In spite of the ambiguity about the exact comfort limits, the studies have been successful in establishing upper and lower boundaries in which human comfort can be attained. One of the phenomena used to establish a boundary is the concept of fatigue. Another is boredom. The prolonged action of a visual stimulus is followed by a rapid decrease in the sensitivity of the eye to visual stimuli. This decline

---

<sup>1</sup>J.E. Flynn and A.V. Segil, *Architectural Interior Systems*, New York: Van Nostrand Reinhold Co., 1970, pp. 94-97.

<sup>2</sup>H. Hewitt, D.J. Bridgers, and R.H. Simons, *Lighting and Environment: Some Studies in Appraisal and Design*, *Trans, Illum. Eng. Soc.*, v.30, n.4, 1965, pp. 91-110.

in sensitivity may manifest itself in muscular activity of the eye or a general feeling of tiredness. Pain in the eyeballs, the decline of acuity of perceived images and subjective complaints (such as discomfort sensations) are symptoms of visual fatigue.<sup>1</sup> Weston differentiates between visual and retinal fatigue by claiming that vision involves motor function as well as sensory processes.<sup>2</sup> The degree of visual fatigue has been estimated through various symptoms by different researchers. Studies have been conducted to measure the fatigue range from the blinking rate of the eye<sup>3</sup> to the exposure time (perception time) needed in order to perceive Landolt rings (broken circles) accurately.<sup>4</sup> Most of these studies have attempted to observe fatigue through the task performances that the subjects were asked to do. Although there seems to be a consensus in the relation between the complaints of tiredness on the part of the subjects and the illumination levels, still no clear relationship exists between the subjective feelings and the objective score. Furthermore, the subjective expression of fatigue and discomfort sensations after working on a task is considerably significant and different for each individual.<sup>5</sup>

---

<sup>1</sup>Hopkins and Collins, *The Ergonomics of Lighting*, pp. 129-150.

<sup>2</sup>H.C. Weston, *Visual Fatigue*, *Trans. Illum. Eng. Soc.*, v.18, n.2, 1953, pp. 39-66.

<sup>3</sup>M. Luckiesh, *Light, Vision, and Seeing*, New York: Van Nostrand, 1944, pp. 205-212.

<sup>4</sup>J.B. Collins and B. Pruen, *Perception Time and Visual Fatigue*, *Ergonomics*, v.5, n.4, 1962, pp. 533-538.

<sup>5</sup>E. Simonson and J. Brozek, *Effects of Illumination Level on Visual Performance and Fatigue*, *Journ. Opt. Soc. Amer.*, v.38, n.4, 1948, pp. 384-397.

While visual fatigue is defined as a weariness resulting from the exertion, both bodily and mentally, of trying to see an excess of visual stimuli, boredom is the result of low sensory input.<sup>1</sup> This is similar to sensory deprivation where the level of stimulation has been reduced from the normal range of exposure to which the individual has become accustomed. Although after a short period of deprivation there may not be a general loss of cognitive functioning, there is still evidence of the deterioration of task performances.<sup>2</sup> Other studies along this line show evidences of adverse effects on cognitive and learning processes whenever individuals are subjected to prolonged periods of sensory deprivation, (i.e. darkness and silence).<sup>3</sup>

Light, recommended by Weston, can reduce the adverse effects (strain) caused by visual boredom.<sup>4</sup> Sunlight is preferred over artificial lighting mainly because of the variations of brightness, chromaticity and brightness ratios. These variations are important not only in reducing boredom, but also for the physiological equilibrium of the human body. Observations have shown that the deprivation of sunlight over extended periods of time can produce not only physiological disorders but can also lead to the development of pathological

---

<sup>1</sup>Weston, Visual Fatigue.

<sup>2</sup>L. Goldberger and R.R. Holt, Experimental Interference With Reality Contact: Individual Differences, in P. Solomon, *et al.*, (ed.s) *Sensory Deprivation*, Cambridge, Mass.: Harvard University Press, 1961, pp. 130-142.

<sup>3</sup>J.P. Zubek, W. Sansom, and A. Prysiazniuk, Intellectual Changes During Prolonged Perceptual Isolation (Darkness and Silence), *Canad. Journ. Psychol.*, v.14, 1960, pp. 233-244.

<sup>4</sup>Weston, Visual Fatigue.

symptoms.<sup>1</sup> Although the biological actions of different kinds of radiant energy and their separate contribution to the total effect of sunlight are very complex, it has nevertheless been proven that ultraviolet radiation provides vitamin D, which is essential for the human body. The different methods of artificial lighting (e.g. fluorescent lamps) which are used to compensate for an environmental deficiency are far less adequate than sunlight. They are inferior to sunlight in their value and especially in their biological effectiveness.

Within the last decade a new trend has developed for windowless buildings. The environmental arguments for this new idea put forth basically are the following reasons: a) establishing optimum micro-climatic environments; b) providing non-distractive working conditions; c) reducing the risks of damage through rioting or vandalism; and d) decreasing the initial building costs. Admittedly, the heat exchange of well insulated sealed buildings is less (especially in colder climates). However, the cost of permanent lighting, heating and cooling equipment, as well as the maintenance costs, have proven to be much greater than was estimated. Furthermore, the output of these electrical and mechanical equipments is one of the major contributing factors to the pollution of the external environment encountered by the urban areas. The studies of the attitudes of the individuals working in these windowless buildings, although not conclusive, are certainly not negligible. Depending upon the type of environment and the activities that take place therein, the effects of external stimuli deprivation vary in degree. Among the psychic costs

---

<sup>1</sup>Goromosov, *The Physiological Basis...*, pp. 48-52.

that people pay for having to work and spend long periods of time in this type of closed environment is claustrophobia or the expectation of it.<sup>1</sup> A common complaint often heard is that people dislike working and living without any sensory contact with the outside environment.

There have been great technical advances in the field of artificial lighting since the days of gas lamps. Improvements have been made based both on the quantitative and qualitative measurements. The minimum standards required of indoor illumination have been increased ten times in the past four decades. However; this progress in artificial lighting has grown inversely with the treatment of natural light in the design process. The growing size of buildings, dependence upon active environmental controls, and many more factors cause the designers to pay less or insufficient attention to the provision of direct sunlight. Direct sunlight is generally regarded as a thermal problem and the visible part of the spectrum is believed to produce only visual sensation.

It is true that infrared radiation can cause overheating which can lead to unfavorable thermal conditions. However, it is also a known fact that artificial lighting can also produce a sufficient amount of heat.<sup>2</sup> The substitution of artificial light for direct sunlight can produce severe limitations and burdens. Additional stress states, due to the inadequacy of artificial illumination, are thrust upon the individuals. Inherent controls (passive) in the design process and

---

<sup>1</sup>Hopkinson and Collins, *The Ergonomics of Lighting*, p. 266.

<sup>2</sup>J.K. Page, The Role of Lighting in the Search for Better Interiors-Some Problems, *Trans. Illum. Eng. Soc.*, v.27, n.4, 1962, pp. 153-163

the controllability over natural and artificial lighting within the dwelling, that should be provided for the inhabitants, can help to avoid the difficulty arising from stressful states.

In the light of the above discussion, it can be said that the practical design considerations for daylight as well as artificial lighting do not only depend upon the amount of light needed or on the problem of glare, but also upon the surrounding environment. The lighting does not only have to suit a particular task but it also should suit the interior of a space and the individual's continually changing needs and moods. Psychological factors, not simply the physical parameters of the luminous forces, are the important elements in generating adverse aftereffects. On no account should lighting be considered as merely a source, whether it be from the window or any other light opening or light fixtures. The whole environment is involved in the process of reducing or eliminating the stress states with which the individual has to cope. One of the characteristics of the surrounding environment is its flexibility and openness to controllability. It is this characteristic of the environment which provides in the individual's cognitive processes of evaluation, an ability to cope with the situation. Glass and Singer's argument about the influence of controllability on the success of the coping process<sup>1</sup> is applicable in the case of the luminous environment as well. The electric shock experiment, which was conducted in addition to the noise experiments, illustrates the effect of controllability and is

---

<sup>1</sup>Glass and Singer, *Urban Stress*, (esp. pp. 138-153).

convincing evidence in generalizing the findings of the noise experiments.<sup>1</sup> To recapitulate: the negative effect of the perceived lack of control over stimulation in the coping process is no less significant in the luminous environment than it is in other environments.

#### RESPONSES TO NATURE

One of the tools that man has developed to free himself from the restricting limitations of his natural environment is the spatial enclosure. This enclosed environment, which Fitch refers to as the "meso-environment" (architectural), is an interface between the micro-environment (the organism) and the macro-environment (terrestrial).<sup>2</sup> This development is one of the relationships of a broader adaptive process that takes place between the organism and its natural environment.

There is hardly a natural environment in which human life could be perpetuated had not man developed an adaptation to the constantly changing forces of this habitat. Thus, adaptation has provided man with the ability to transcend the limitations of his biological faculties and his natural environments. While among lower animals, adaptation takes place basically by means of genetic mutation, i.e. biological adaptation, man accomplishes this by means of both biological and cultural adaptations.<sup>3</sup> By culture, we mean the integral whole consisting of tools, artifacts, the organization of social actions,

<sup>1</sup>Glass and Singer, *Urban Stress*, pp. 109-120.

<sup>2</sup>Fitch, *American Building*, pp. 16-19.

<sup>3</sup>T. Dobzhansky, *Mankind Evolving*, New York: Bantam Books, 1970, (1962), (esp. pp. 1-23, 53-78); P.B. Medawar, 'The Meaning of Fitness and the Future of Man', in Y.A. Cohen (ed.), *Man in Adaptation: The Biosocial Background*, Chicago: Aldine Publishing Co., 1968, pp. 27-37.

beliefs, attitudes, ideologies, in short all of those exosomatic means employed to maintain life in the natural environment. Admittedly, biological adaptation has been a significant contributing factor in man's life, especially when viewed in the broadest context of evolutionary processes. Nevertheless, it would not be exaggerated to state that cultural adaptation contributes a paramount potentiality for adapting to changing environments. Man's ability to come to terms with and make the most of the changing environment lies in his cultural capacity to adapt.<sup>1</sup>

The socio-cultural system, man's own creation, evolves by means of the individual's psychological structuralization in an organized social system. Through the infusion of appraisals that involve cognitive, affective and evaluative values, the socio-cultural system enhanced the potentialities for man's survival and adaptation; the functioning of the socio-cultural system is very much dependent upon the psychological factors. Hallowell attributes this dependence to the fact that "...socially sanctioned values that characterized them [sociocultural systems] were linked with the cognitive processes, motivations, and need satisfactions of individuals through the formation of a new and distinctive type of personality organization

---

<sup>1</sup>Cultural adaption to nature does not necessarily mean that culture is determined by environmental conditions. It would be a gross misconception to assume that the physical environmental elements are the only factors involved which characterize a culture. It is a two-way process as R.A. Rappaport states: "...it should be kept in mind that although it is in terms of their conceptions and wishes that men act in nature it is upon nature herself that they do act, and it is nature herself that acts upon men, nurturing or destroying them." Nature, Culture, and Ecological Anthropology, in H.L. Shapiro (ed.), *Man Culture and Society*, London: Oxford University Press, 1971, pp. 237-267, (p. 246).



molded in the socialization process."<sup>1</sup>

It is this cultural capacity, the ability to learn, accumulate and transmit experience within a social context, that led to one of man's responses to nature, namely the meso-environment. The meso-environment provided the means to a terrestrial existence as opposed to arboreal survival. The built environment became part of the broader adaptation process in order to face the realities of the physical environment. Man's built environment has developed as his learning increased through his expanded psychological capacities. With the accumulation of experience and thought, the cognitive processes function at much higher levels and broader faculties in coping with the possible stress states that may be due to the natural forces. Basically, the natural forces that act upon the housing environments consist of climatic (sun, wind, precipitation), geographic (slope, hydrology), pedologic (soil types, drainage, erosion) and vegetational forces. In addition to these natural forces, the availability and type of materials that can be utilized for building construction are significant. Less frequently recurring events such as earthquakes, floods, droughts, tornadoes, fires, etc., are definite sources of stress states. The immediate strains that arise from such hazardous threats cannot only cause dysfunction but even a threat to life.

Man's cultural response to nature consists fundamentally of two forms of adaptation: 1) *exploitation*, and 2) *relocation*. Both of these modes of response are bounded by space (spatial aspects) and time

---

<sup>1</sup>A.I. Hallowell, *The Protocultural Foundations of Human Adaption*, in Y.A. Cohen (ed.), *Man in Adaptation: The Biosocial Background*, Chicago: Aldine Publishing Co., 1968, pp. 62-75, (p. 72).

(temporal aspects). Furthermore, either of these forms of adaptation or their combination are limited within themselves. Each form of adaptation is unique for a particular environment. Their occurrence or the choice of response is not abstract but is in a concrete relation to specific environmental forces. Accordingly, each form of response is limited, for any society, by the current state of the culture, that is the nature of the social organization, productive forces, economic structure and so forth. Therefore, it would be a serious misconception to assume that responses to nature develop only within the realm of physical environmental forces. The adaptive process, in the built environment, is as much cultural as it is physical. The process is of an ecological nature, that is, it involves the conservation and dissipation of energy, the maintenance of a mutual balance between man and his environment, and adaptation (biological and cultural).

In order to meet his needs, man exploits the sources of his environment. To create suitable indoor living conditions, he must turn the available materials to practical use. This transformation process is not always an incorrect utilization of the available means. However, it is certain that any transformation process brings about a change, whether it be big or small, in the ecological structure of that environment. While the purpose of the meso-environment is to reduce the stress states which may develop due to the physical environmental forces, the built environment may create additional strains upon the environment itself. In return, man has to cope with the newly developed physical forces as consequences of his own activity. Once the stability conditions of the ecological structure are forced beyond

the limits of resilience, there are reciprocal effects of changing patterns of human activity upon the environment. Thus, *man does not only adapt to changes brought about by the physical environmental forces but also copes with the alterations in the environment that he himself produces.*

Two types of stress should be differentiated at this point.

The physical environmental demands may cause a stress state if the capacity of the individual's coping processes is not adequate enough to meet the magnitude of the threat. When the resources to be utilized in the coping process are insufficient with regard to the demanding stimuli, stress states are very likely to occur. The resources may range anywhere from the individual's biological response capacity to the tools available, from personality structure to the ability to control the environment in that particular space and time. The demanding stimuli, in this case the natural forces acting upon the individual, are basically of two types: those that are met in daily life more frequently than others, such as strong wind, rain, blowing dust, summer heat, etc.; and those that are encountered less frequently, such as earthquakes, floods, storms, etc. An individual's coping process is limited by his response capacity and by the purpose. The purpose, the intended or desired result, depends upon the preferential hierarchy of needs and values, which gives rise to decision rules that make a preference between alternatives.<sup>1</sup> If the choice of alternatives is very limited, then it is more likely for the coping process to have more difficulty in dealing with the demands. Therefore, situations

---

<sup>1</sup>J.G. Miller, *Living Systems: Basic Concepts, Behavioral Science*, v.10, n.3, 1965, pp. 193-237, (esp. pp. 231-233).

where the purpose and the environmental demands are incompatible are potential sources for stress states.

The second type of stress state is that which springs from man's activities and his impact on the environment. Any type of activity that may result in an evident response in the natural system is conceptualized as a load acting upon the environment. If this evident response manifests itself with some undesirable effects (strains, such as erosion, the vanishing of vegetation, etc.) that cause some changes in the ecological balance, then the conditions that arise from man's activities are considered to be stress states for the environment. Nature's coping process consists only of the response capacity. Therefore, for the natural system, the choices of alternatives are very much limited. The cognitive capacity, which is a unique characteristic of man, does not exist in the natural environment.

There has always been temptation to attribute the explanations of historical and cultural phenomena to the physical environmental forces.<sup>1</sup> Environmental determinists have the advantage of providing empirical phenomena from which a straightforward analysis can be carried to exhibit the cause and effect processes. This approach represents not only a very short-sighted view but also an oversimplified perspective of the ecological relationship. The empirical phenomena that can be presented for the purpose of analysis may be acknowledged, on a closer inspection, as not being as independent of the other cultural influences

---

<sup>1</sup>E. Huntington, *Civilization and Climate*, (3rd Ed.), New Haven: Yale University Press, 1924; E.C. Semple, *Influences of Geographic Environment*, New York: Russell & Russell, 1968, (1911), (esp. pp. 1-73, 473-520, 557-637).

as they may appear. The misleading simplicity of positivistic empiricism and the neat schematic straightforwardness of philosophical formalism are not consistent with the complexities of a dialectical framework that exists in the man-environment relationship. The complexity of human activities and institutions lies in the social order rather than in the direct environmental factors. This complexity increases as the social organizations and other cultural influences develop to higher levels. The impact of environmental forces can be more easily detected in simpler societies. In other words, physical environmental factors, which have provided the principal stimulus to further the development of built-environments, are more readily seen in the earlier and less complex societies. For the purpose of clarity, in showing the influence of natural forces, some past cultures will be investigated.

#### *Exploitation*

One form of adaptation to natural forces is exploitation. A case study, explaining this adaptation form, is selected to focus on the Anasazi culture, which existed in the San Juan Basin.<sup>1</sup> Today more commonly referred to as the Four Corners (Utah, Colorado, New Mexico, Arizona), the San Juan area is considered for several reasons. It is an area large enough (approximately 30,000 square miles) to provide a

---

<sup>1</sup>The principal sources that were utilized for the study of the Anasazi culture are: A.V. Kidder, *An Introduction to the Study of Southwestern Archaeology*, New Haven: Yale University Press, 1924, (esp. pp. 165-253 and 323-351); H.M. Wormington, *Prehistoric Indians of the Southwest, The Denver Museum of Natural History Popular Series, No. 7, 1947*, (esp. pp. 27-117); E.P. Dozier, *The Pueblo Indians of North America*, New York: Holt, Rinehart and Winston, Inc., 1970; R.B. Marcus, *The First Book of the Cliff Dwellers*, New York: Franklin Watts, Inc., 1968; more specific references are made separately in the text.

sufficient number of examples over a widely spread territory so that generalizations that can be derived are not subject to a specific locality. Yet, it is small enough to have similar environmental conditions in the different settlement locations so that any diversity from a set pattern of planning, building and construction systems can be easily attributed to forces other than natural ones. Furthermore, a great amount of material, regarding a sequential development of built environment over a period of two thousand years, has been documented. Not only are these archaeological and anthropological studies valuable guides today, but also most of the ruins are still in relatively good condition to provide concrete evidences for carrying on field studies as well as for guiding the observer to further delineate the ecological relationship between man and his environment.<sup>1</sup> The San Juan area basically consists of prairies, mountains and terraced mesas. It rests on a plateau at a higher elevation than its surrounding areas. Drainage sources which have formed numerous gorges in the tableland have been the major element in the farming capacity of its sedentary inhabitants. In addition to the seasonally running streams, the small springs which appear at the heads of gorges or the bases of cliffs made the occupancy possible. A typical, hot and arid inland climate prevails over the whole area: seasonal and diurnal temperatures fluctuate considerably (with very cold winters and chilly nights, even in the summer); major precipitation occurs in mid-summer with heavy downpours; relatively strong winds during the daytime are considerable

---

<sup>1</sup>Much information has been set forth by the many studies which have been done about the various Indian settlements in the Four Corners area of the Southwest. In addition to what these studies have shown, I have used my own research and field studies in that area to carry out further certain aspects which have not been dealt with by the other researchers.

factors; clear, cloudless skies enhance the re-radiation from the earth at night; major vegetation consists of scattered trees (ponderosa, pinyon) and shrubs (nowhere in the area are there dense trees in the sense of a forest).

The Anasazi cultural sequence, though a continuous one, has been divided into two major successive periods: *the Basketmaker period* and *the Pueblo period*. Architecturally this division seems appropriate since major developments in dwellings are occurring accordingly. However, a more detailed classification, suggested by Roberts, may be useful in seeing the developmental stages in their housing environments: the Basketmaker period (0-400 A.D.), the modified Basketmaker period (400-700), the Developmental Pueblo period (700-1100), the Great Pueblo period (1100-1300), the Regressive Pueblo period (1300-1600), the Historic Pueblo (1600-the present).<sup>1</sup> The dates given here, of course, are not precise dates, they are meant only to give a close approximation.

The early Basketmaker stage is a transitional one between the "food gathering and hunting" form of life (the Desert tradition) and the sedentary agriculturist settlement (Anasazi). The shelters of this period are going through a similar transition stage as well. From caves on cliff sides, large tree trunks and flimsy brush shelters, people of this era are gradually transferring to semi-subterranean dwellings. The houses of this period are basically built over circular depressions. The saucer-shaped excavations are covered with wood set

---

<sup>1</sup>F.H.H. Roberts, Jr., A Survey of Southwestern Archeology, *American Anthropologist*, v.37, n.1, 1935, pp. 1-35. (p. 32).

in mud mortar. The roof rests on the inclined walls made out of small timber and pieces of branch which are heavily filled with mud. The roof structure is monolithic with the walls. There are no indications of any openings except for an entrance passageway dug into the ground. The heating was accomplished in the fire-pits situated in the center of the circular layout.

There must have been two major problems that the occupants of these dwellings had encountered. One is ventilation and the other is water seepage into the dwellings. The smoke from the fire could not have very easily escaped from the one access to the outside. Admittedly, these people spent most of their time outdoors. Nevertheless, on long winter nights they must have faced a significant problem with the fire in an almost totally enclosed space. The second natural force with which the builders of these dwellings had not dealt, is the rising of the water-table (especially in the rainy season) and consequent water seepage through the earth wall dug into the ground. Granted that this is not the case for these semi-subterranean-houses built in front of large rock shelters worn out by the action of weathering, the problem still exists for the dwellings that were built at the base of the cliffs and even on top of the mesas. Since some of the farming, as primitive as it could have been at this period, was done on the mesas, *the water table must have been rather close to the surface particularly during the rainy seasons.* Their response to the water problem at a later stage (elaborations of this response will be discussed in the Great Pueblo period) give convincing clues to validate the hypothesis presented here.



The growing dependence upon agriculture required more permanent types of dwellings and settlements. Hence, as the people of the Modified Basketmaker period became more involved in an intensive agriculture, the changing living patterns and past experience led to further developments in the semi-subterranean dwellings. The pit houses were lined with stone slabs. Not only were they lined with stone slabs, but even plastered with mud on the inner face. This is the first effective response to the water problem. There is also evidence of adobe bricks being placed over the stone slabs.<sup>1</sup> The covering structure over the pit is not different, construction-wise, from that of the previous period. However, there is one major development in the roof. This is the opening provided in the center of the roof directly above the fire pit. Along with the entrance tunnel, the roof opening supplied sufficient amounts of air to circulate within the dwelling. Later, the opening in the roof became the major entrance. A ladder leading down to the dwelling was placed in this opening. Although reduced in size, the earlier entrance was still kept for ventilation purposes. These early developments were to be the basis for the later architectural details. For example, the Kiva (an underground room used mainly for religious purposes) construction was based entirely upon the principles of the early pit houses.

At first, this pit was circular but later in the period it became oval and eventually rectangular. Constructionally there should not have been much difference from one geometric shape to another. Several possible explanations can be given for this particular shape

---

<sup>1</sup>Wormington, Prehistoric Indians of the Southwest, p. 50.

transformation. First, the people of this period lived in villages which consisted of irregularly grouped houses. Toward the end of this period, a tendency for joining several individual units had emerged (the concept of row houses). Shapes other than rectangular ones may be harder to obtain for the purposes of joint construction. Secondly, the occupants of the pit houses had to depend upon the heat gain of the walls and the roof, and their heat retaining capacity. Chilly night temperatures (even in the summer) and the cold winter temperatures demanded the maximum possible amount of heat to be stored by the surfaces during the daytime so that they could release the heat to the inside of the dwelling when it was needed. Rectangular shapes have greater surface area to enclosed area ratio than the rounded shapes. This means that more heat is stored in the walls. Although larger surfaces have the capacity to store more heat, they will also release heat more quickly than smaller walls. But a combination of materials (mud, wood, stone) which was used in the construction, created a long time-lag (the difference between the time of maximum surface temperature and heat gain on the outside surface of the wall and the time of maximum surface temperature and heat loss to the air on the inside of the wall) of about eight to ten hours which made possible the use of heat that was stored in the walls without too much heat loss. Thirdly, the separation of living quarters from the ceremonial chambers was first started during this period. A differentiation of functions was not only expressed in terms of separate spaces but also in terms of separate shapes. Specialization in the social activities was reflected in the built environment through this type of differentiation.

Construction began with the digging of the pit. A wooden roof frame

was set upon the four major structural poles. Small pieces of timber were set at intervals in an upright but inclined position, resting on the roof frame and all along the periphery of the pit, forming the semi-conical structure. Branches and other small pieces of wood were used to fill the space between the timbers making up the structure of the inclined wall. The roof was built in the same manner. Then the whole structural timber wall was covered with heavy mud. This was the beginning of wattle and daub construction, although at a very primitive level. This type of construction is also referred to as jacal construction.

The extensive and free use of wood for construction and heating purposes became a major issue in the later periods. The tree lines had already been pushed out to far away places from the settlements. This was the result of almost seven centuries of exploitation of the environment. A vegetation, originally not very dense, became even more scarce. The wood to be used for construction purposes had to be brought from considerable distances. This phenomenon was one of the stimuli that eventually led to the search for different means of construction, that appeared in the later stages.

From 700 A.D. on an intensive experimentation in housing began. Multiple as well as single unit dwellings were basically one story structures until the Great Pueblo period. Masonry construction started to replace wattle and daub construction. Masonry was done with either fabricated adobe bricks or stones. The growing use of masonry construction can be partially attributed to the increasing scarcity of trees as well as to the advancing construction knowledge.

Admittedly, the new construction system adopted by the people of the Anasazi culture, had some advantages over the jacal construction, such as, easier construction, more effective in solving some of the problems encountered by the occupants (e.g. ventilation or water seepage), more flexibility in terms of the spatial arrangement; accomodating the idea of communal living which began at this time; and better construction material with regard to structural capacity and thermal resistivity. However, *the state of vegetation at that time must have been one of the more influential factors in the transformation from jacal to masonry construction.* By the beginning of the eighth century, the concentration of population in some settlements was significant enough to reinforce the hypothesis stated here. For instance, excavations in southwestern Utah uncovered about ten settlements with as many as three hundred surface dwellings in each village.<sup>1</sup> If the population per room is conservatively assumed to be two and one half to three persons, then there were entire pueblos with as many as seven hundred and fifty to nine hundred persons. Considering the available resources of the environment and the time span (about seven centuries) these concentrations of population were not insignificant with regard to the exploitation of the natural resources in order to satisfy their needs, namely, housing and heating needs.<sup>2</sup>

---

<sup>1</sup>J.O.Brew, *Archaeology of Alkali Ridge, Southeastern Utah*, *Papers of the Peabody Museum of American Archaeology and Ethnology*, Harvard University, v.21, 1946, (esp. pp. 106-202); the author also gives descriptive architectural information pertaining to different periods and discusses the development of house architecture which finally led to the multi-story dwellings, (see: pp. 92-96 and 215-226).

<sup>2</sup>Exploitation in this case was not merely a function of the *economic* determinism which seems to be the prevailing issue at present. In his book, *Design with Nature*, Garden City, New York: Doubleday/Natural History Press, 1969, I.L. McHarg argues that the present day economic

At the end of the Developmental Pueblo period and particularly in the Great Pueblo period, the advancing architecture led to large multi-story masonry buildings among the cliffs (e.g. Mesa Verde) and on the valley floors (e.g. Chaco Canyon). The most pronounced characteristics of these large dwellings are their design and their orientation for the purpose of utilizing and maximizing the solar energy.<sup>1</sup> The semi-circular arc or the rectangular U-shape layouts of the multi-story dwellings, oriented principally to the south (some were oriented towards the southwest or southeast) led researchers to hypothesize the direct relationship between the orientation and the stepped-up construction to the utilization of the energy received from the sun. This hypothesis is even more strengthened when the cliffs behind the dwellings are taken into consideration. The cliffs on the east or north side of the large apartment houses acted as reflectors for the sunlight. This phenomenon almost doubled the effect of the heat gain that was necessary for indoor living conditions, especially at night. Therefore, in this manner, the maximum exposure to the sun was further augmented by the reflection effect of the cliffs.

There is, however, need for careful study of all of the facts before accepting the hypothesis stated above as true in all cases. Although

---

concerns are more ephemeral in nature, which is quite removed from the empiricism of early men. "They [the early men] tried to understand the phenomenal world and through behavior, placation and sacrifice, diminish adversity and increase beneficence. This early empiricism remains a *modus vivendi* for many tribal peoples notably the American Indian--and conspicuously the Pueblo--today." pp. 25-26.

<sup>1</sup>Taken from personal conversation, I have had with Professor R. Knowles of the University of Southern California; this has also been one of the major issues analyzed in a paper that was mentioned earlier: Turan, "Environmental Influences..."

there is much convincing evidence to support the idea of a link between the built-environment and natural occurrences, there are also numerous proofs to the contrary. Several pueblos in Chaco Canyon, for example, were not built with the same orientation. Furthermore, they were built on mesas instead of on the valley floors so that they received no advantage from the sunlight being reflected by the cliffs. Admittedly the number of such deviations from the general rule was few (only three out of a total of twelve large pueblos found in Chaco Canyon, an area about eight miles long and two miles wide).

Nevertheless, reconsideration of this hypothesis seems inevitable until the true energy exchange relationship and the other social factors involved are established on firmer grounds. Almost all of the farming was done with the aid of flood irrigation in the valley bottoms and some ditch irrigation on the mesa tops. To compensate for the deficiency of rain in some relatively dry seasons, steep channels, known as *arroyos*, were cut into the flood plains. The arroyos helped to lower the water table on the mesas and provided more water for ditch irrigation. However, this response, to the periods of deficient rainfall brought with it greater ecological consequences. The farming along the flood irrigation areas (the valley bottoms) became almost obsolete since watering of the areas depended upon the surface run-off water coming from the mesas. The arroyos not only deprived the flood irrigated valley bottoms of water but also dissected the fields on the mesas, causing erosion and eventually the loss of some of the valuable farming land.

The reasons for lowering the water table were two-fold. One, as already mentioned, was meant to prevent the water seepage from entering

the pithouses. Slabs of stone covering the excavated surfaces were one of the necessary, although not very effective, means of dealing with the problem of water penetrating into the living and storage areas. Therefore, lowering the water table was a second step in coping with the situation. Another reason for lowering the water table was mainly for the purpose of achieving more effective irrigation. The long term impact and results of this response to the water problem, whatever the major reasons may have been, were rather costly in terms of the ecological relationship.

The Great Pueblo period, in which superb dwellings were constructed (e.g. Pueblo Bonito in Chaco Canyon and Cliff Palace in Mesa Verde) came to an end toward the end of the thirteenth century. There are basically three different theories (as well as some other suggested causes) which attempt to explain the complete abandonment of the great houses. One theory relates to the natural causes, specifically the series of drought periods in the latter half of the thirteenth century.<sup>1</sup> Tree ring records, which date back to the last quarter of the century, support the theory of the progressive dessication of the Southwest. The gradual migration from the pueblos, which finally left these very unique dwellings deserted, is attributed to this disastrous drought. A second theory attributes the mass migration from the pueblos to the

---

<sup>1</sup>E.L. Hewett, J. Henderson, and W.W. Robbins, *The Physiography of the Rio Grande Valley, Bulletin 54, Bureau of American Ethnology, Washington, 1913*; the "Great Drought" theory gained more support with the development of tree-ring readings by A.E. Douglas. For example see his *Dating Pueblo Bonito and Other Ruins of the Southwest, National Geographic Society, Contributed Technical Papers, Pueblo Bonito Series, Washington, n.1, 1935.*

actions of the inhabitants themselves.<sup>1</sup> This theory is basically built upon the suggestion that the economy of the farmers of this era was upset by the people themselves, through actions such as cutting in arroyos, and not necessarily by the severe drought alone. Yet, still a third theory is advanced, that the nomadic tribes were attracted to the wealthy and rather comfortable life style of the pueblo people.<sup>2</sup> This theory acknowledges the impact of the inhabitants of this area upon the environment, but argues that the people were not only adapted to the arid conditions of their environment for centuries, furthermore they shaped their culture on this vital factor. Therefore, the migration must have been due to some external factor.

Whatever the causes may have been, aridity, the impact of the people upon the environment, the attacks by nomadic tribes, or a combination of these,<sup>3</sup> the people of the great pueblos had to establish new settlements in different locations, such as in the basins of the Little Colorado and Rio Grande rivers. After a period of instability and population shifts, new communities were founded with a tendency for building larger houses. Masonry and floor construction were even more

<sup>1</sup>J.T. Hack, *The Changing Physical Environment of the Hopi Indians of Arizona, Papers of the Peabody Museum of American Archaeology and Ethnology*, Harvard University, v.35, n.1, 1942, (esp. pp. 76-80); the "Arroyo-Cutting" theory is further supported by geological surveys which found correlations between the periods of depositions and erosions. See: K. Bryan, *The Geology of Chaco Canyon, New Mexico, Smithsonian Miscellaneous Collections*, v.122, n.7, Publication 4140, 1954.

<sup>2</sup>Kidder, *An Introduction to the Study of Southwestern Archeology*; also see: H.S. Gladwin, *A History of the Ancient Southwest*, Portland, Maine: Bond Wheelright Co., 1957.

<sup>3</sup>There are also advocates of multiple causes which explain the migrations. For example: S.C. Jett, *Pueblo Indian Migrations: An Evaluation of the Possible Physical and Cultural Determinants*, *American Antiquity*, v.29, n.3, 1964, pp. 281-300.



refined in some cases, such as in the Puye and the Tyuonyi cliff and mesa dwellings. A concern for the natural forces, backed up by security reasons, was a main factor considered in the construction of these dwellings. It was not until the middle of the sixteenth century, when Spanish troops threatened the settlements and Navajo harassment began, that security became a more crucial factor than that of the forces of the natural environment. The pueblo Indians were forced to build their dwellings on the mesa tops. Some of these mesa top pueblos are still inhabited by a few of the Hopi tribes (e.g. Oraibi, Walpi and Accoma).

Needless to say, by this time the natural forces, which very much effected the indoor comfort conditions of the pueblo Indian homes, were being dealt with by more sophisticated architectural elements inherent in the design process. This is not meant to suggest that the significance of the natural forces had been reduced. The design responses had to satisfy the basic needs before they could gratify security and other needs. With the expansion of knowledge and accumulation of experience, secondary needs could be considered without upsetting the effectiveness of the coping processes dealing with the more primary needs. However, this does not necessarily mean that the ecological relationship is not effected. Nor does this indicate that stress situations, which may be the result of natural forces, are completely eliminated.

#### *Relocation*

The second major form of adaptation to the natural forces is relocation. The explanation for this form of adaptation will be presented with a

case study focusing on the Paiute Indians.<sup>1</sup> This group, a plateau branch of the Shoshoneans, occupied a large valley in east-central California. The valley, approximately 3200 square miles, has a major axis in the north-south orientation with a twenty-five to fifty mile basis in the east-west direction. On the west are the towering Sierra Nevada mountains and on the east the valley is bounded by the White and Inyo mountains. This basin, known as Owens Valley, extends to Mono Lake in the north and to Owens Lake in the south.<sup>2</sup>

Contrary to the San Juan Valley area, Owens Valley is a depression squeezed between mountain ranges and it primarily consists of a semi-arid upland basin at a general elevation of thirty-five hundred feet. Any precipitation coming from the east or west is stopped by the mountains surrounding the valley, causing arid conditions for most of the year. Although the cultures which inhabited such plateaus are generally referred to as having lived a Desert Tradition, the environment is far from being a true desert. In spite of the high altitude, summer daytime temperatures are relatively high (32°-38°C or 90°-100°F). The winters on the other hand, are considerably cold. A typical

<sup>1</sup>The name "Paiute" has been spelled differently by various authors. For example: "Piute," or "Pahute." Also, this branch of the Shoshoneans have been referred to as "Mono" or "Paviotso." "Paiute" has been adopted here for it is used more extensively than the others.

<sup>2</sup>The principal sources that were utilized for the study of the Paiute Indians are: E.S. Curtis, *The North American Indian*, 20 vols.; New York: Johnson Reprint Corporation, 1926, v.15, pp. 53-85; C.D. Forde, *Habitat, Economy and Society*, New York: E.P. Dutton & Co., 1963, (1949), pp. 32-44; R. Knowles, *Owens Valley Study: A Natural Ecological Framework For Settlement*, Los Angeles: University of Southern California, 1969; J.H. Steward, *Ethnography of the Owens Valley Piute*, Berkeley, Calif.: University of California Press, 1933; more specific references are made in the text.

hot-arid inland climate dominates, especially in the lower depressions of the basin. Not only are there significant fluctuations between seasons but there are also fluctuations in the diurnal temperatures. Typical of hot-arid climates, the major precipitation occurs during the summer. The rainfall, differing from the San Juan area, is scanty and comes in the form of light thundershowers. The precipitation is even lower in places that are situated away from the mountain ridges. There are numerous streams fed by the high mountain snows. However, by the end of spring, these streams dry and vanish in the sands and gravel of the basin or flow into the shallow salt lakes of the valley. The vegetation is distinctly grouped into horizontal belts. While on the valley floor, patches of bunch grass, sage brush and other scrub dominate, a belt of grassland occupies the lower slopes of the mountains. Dense coniferous forests cover the high bordering ranges. In between the high ranges and the grasslands, thinner woodlands of pine and juniper-pinyon are found. Willow and other deciduous trees grow along the streams.

The Paiute Indians lived a rather secluded existence in this area until the second half of the nineteenth century. Since the time of their arrival in Owens Valley (about 1150)<sup>1</sup> until almost the twentieth century, they remained a food gathering society. Without significantly exploiting any particular environment for a certain length of time, the people of this Desert culture lived by a continuous relocation process. Their response to environmental conditions was a rhythmic change of location dependent upon natural intervals. The natural

---

1R.C. Euler, Southern Paiute Archeology, *American Antiquity*, v.29, n.3, 1964, pp. 379-381.

recurrences, mainly the energy events which vary at certain time intervals, were the main stimuli for their relocation response. Being highly dependent upon what existed in their immediate environment, the group had to move to more favorable locations, to keep their existence (barely at a survival level) going. A stable relationship to natural recurrences was established. This resilience of stability was bounded by spatial and temporal dimensions. Since the capacity of any ecological system lies in between the range of environmental conditions, the existence of the Paiute Indians depended upon their limited capacity to respond to the changing environmental conditions. The need for food and shelter dominated this response and the need system appears not to have developed to higher levels.

There were basically two types of settlements: a) a semi-permanent and fairly large winter settlement and b) temporary and scattered family residences. These two types of settlements were in direct accord with the activity that they performed depending upon the season. Food gathering took place at all times except in wintertime. Families spread out during this period and this gave them the widest territorial boundaries, although no distinct territorial rights were established.<sup>1</sup> The wide territories expanded each family's (or group of families) coverage area for food. Hence, this maximized their choice and collection. The extensive storage of food, to compensate for the lack of vegetables during the winter months, is a feature that is not characteristic of other groups of food gatherers, such as the Semang of the Malayan forests and the Bushmen of the Kalahari Desert.<sup>2</sup>

<sup>1</sup>Forde, *Habitat, Economy and Society*, p. 34.

<sup>2</sup>*Ibid.*, p. 36.

Generally, the surplus of food collected during the favorable months was sufficient to last out the unfavorable period, and so the food gathering activity was not carried out in the winter time. Therefore, being closer as a group in the semi-permanent settlements during the winter months did not interfere with the subsistence economy of the Paiute Indians. This also gave them the opportunity to execute most of their social and cultural activities (as few as they were) as a group.

The semi-permanent villages, situated at the meeting line of the Sierra Nevada Mountains and the valley floor; were on the lower end of an alluvial fan.<sup>1</sup> This location was not only a place well protected from the severe winter winds coming from the mountains on the west, but it was also in close proximity to the favorable places to where they migrated each spring and summer. These villages were situated at a slightly higher elevation than the swampy lands of the river basin.

The level of sophistication of these dwellings was nothing comparable to those of their contemporaries living in the San Juan area. The house was either a conical shape or a dome shape structure built out of juniper or willow poles and covered with dried tule reeds or tall grasses. The poles were set along the periphery of a shallow pit dug into the ground. The pit was about four meters (12-14 feet) in diameter. The poles were bound together at the top. This structure was covered on the outside with stout bark strips and grass, thatched in place by horizontal battens which were laid on the covering and attached to the frame. At the top of the structure, in the center, there was a smoke hole. The fire pit was directly below the smoke hole. A door opening

---

<sup>1</sup>Knowles, *Owens Valley Study*, pp. 11, 14-15.

was left on the east side and it was framed with heavier poles to provide a little more structural stability. A blanket made of rabbit skins served as the door. In addition to this type of dwelling (known as the *wikiup*)<sup>1</sup> in each village there was also another enclosed space called the sweat house. Slightly larger than the *wikiup*, the sweat house was built in the same manner but more carefully and with a deeper pit.

The dwelling served several purposes rather effectively: it kept the rain out; due to its overall shape it responded to the strong winds of the winter with the aerodynamic features required of such flimsy structures; and it provided the enclosed space needed for the functioning of the intended indoor activities. Due to its material characteristics and its construction, it could not retain any heat indoors unless there was a fire kept lit continuously. The choice of the location of these semi-permanent settlements were, therefore, dependent upon the proximity of available firewood, or, specifically the wooded areas.

In the springtime, the group moved to a slightly higher elevation in the valleys along the Sierra. Later in the summer, they moved to an even higher elevation where they found the coolness of the high plateau region quite comforting.<sup>2</sup> Toward the end of summer, when conditions would permit them to make the passage, they migrated into the mountains on the east, where they spent the remaining time until winter set in. Before the harsh winter conditions began, they moved back to their semi-permanent villages with all the surplus of food that they had

---

<sup>1</sup>Forde, *Habitat, Economy and Society*, p. 34.

<sup>2</sup>Knowles, *Owens Valley Study*, p. 14.

collected in the course of the three previous moves. The distribution and nature of the water supplies suggest that these seasonal relocation patterns were entirely feasible for these Indians, in spite of the fact that they did not utilize animals for transportation. Wedel, writing about other similar groups, argues that travel in and through the region, except in times of severe environmental conditions (e.g., severe drought or winter storm), would have been practicable for experienced plainmen.<sup>1</sup> This was necessary not only for immediate survival but also for the long term maintenance of an ecological balance. Since the areas they inhabited during periods other than winter were not always the exact same locations, they maximized their chances of collecting food by alternating territories yearly and seasonally.

During the food gathering activity, their dwellings were nothing more than unwallled shelters which provided shade and kept the area dry against the light summer showers. A square roof of grass and brush, supported by four poles or simple wind-breakers built up with stakes and brush, were the only types of shelters used. These shelters were very often not used a second time. There was even a tendency to demolish the winter houses with the intention of rebuilding them in a different location in the fall.<sup>2</sup> Infrequently, at some intervals this was done, and favorable locations on the Inyo Mountains were found. They migrated there for the fall season but would remain there throughout the mild winter.

---

<sup>1</sup>W.R. Wedel, *The High Plains and Their Utilization by the Indians, American Antiquity*, v.29, n.1, 1963, pp. 1-16.

<sup>2</sup>Curtis, *The North American Indians*, v.15, p. 62.

In this survival plan, it seems apparent that there was extensive use of the forests. After seven centuries of exploitation of the scarce wooded patches in the San Juan area, the Anasazi culture had to adapt to the changing environment with different means. Despite almost seven centuries of habitation in one valley and an extravagant use of the available resources, the Paiute Indians did not have to change their traditional way of life because of an environmental cause. Admittedly, the Owens Valley area, especially on the higher ranges, is much richer in terms of vegetation than the San Juan area. Nevertheless, their choice of relocating themselves every season and every year was not due to chance but to the accumulation of experience and the knowledge gained from this experience. As primitive as their existence may have been, some cognitive process must have been the guiding factor in their relocation each year. As Knowles argues, cyclical relocation must have been a purposeful response to maximize choice and minimize environmental stress which might be directly due to the environmental conditions.<sup>1</sup>

An entirely different culture, but one which has been responding to the environment with this type of adaptation (relocation) is that of the pastoral nomads of central Asia (Kazak, Kirghiz and Kalmuck).

Their residence patterns show a great similarity with that of the Paiutes. An exception to this is the mobility and portable qualities of their *Yurts* (a Turkic word for "home"), which are transported to every new location. Unlike the high ranges of the Sierra Nevada or Inyo Mountains, the high plateaus of central Asia are not covered with dense forests. Therefore, every possible means of conservation as well

---

<sup>1</sup>Knowles, *Owens Valley Study*, (esp. pp. 5-44).



as the maximum use of the yurts must be made by the nomads in order to maximize the choice and minimize the environmental stresses. This traditional type of housing, which has remained unchanged for centuries, has been the response of the Turkic peoples to their natural environment and has provided the satisfaction of all their needs.

The rather unique characteristics of the yurt were basically influenced by the life activity of the nomads, their living pattern and the environmental demands. Its features, which satisfied the needs of the nomads as well as the conditions of the environment, have been the major determining factors in its use for centuries. The evolution of the yurt, its long existence and its portable advantage as a permanent home, are all part of the adaptation process resulting from the cognitive ability of the people. The nomad's perseverance in using the yurt for as long as it lasts is directly related to his cognizance of the long-term ecological concerns. Due to the economy of scarcity, by which the nomad has to live, his long term use of the yurt increases his choice for other life activities so that the long term reciprocal effects of his response to nature, as a result of this type of housing, is decreased. Therefore, it can be seen that this process, derived from nature, is one which inherently considers the environment as a whole and it is not impermanent as centuries of use have proven.

To recapitulate some of the important factors concerning man's consciousness and his existence in the natural environment:

A- Man exploits and transforms the sources in his natural environment to satisfy his needs. This need satisfaction can also be achieved through relocation. The process takes place according to the current

state of the productive forces, the social organization, tools, and in short the culture.

B- The spatial distribution of the human population and the uneven development of human activity is determined by the differentiated natural environment and the material conditions of life in that particular habitat.

C- The differentiation of human activity over space is also dependent upon the historical social processes taking place in different areas. Therefore, personality structures and social organizations in the historical development influence the nature of the human activity, whether that influence is direct or indirect.

D- Man, the biosocial being bound by his natural physical environment and the economic structure of the social organization to which he belongs, makes up the patterns and the spatial structure of the settlements.

E- The maximizing of choice, within stable boundaries, to reduce the environmental stress conditions depends not only upon the natural environment but also upon the cognitive capacity, which develops continuously over a person's lifetime. Cognizance of the surrounding environment leads to a broader conscious existence, the actual life process. This is a function of the social relations as well as of the concrete circumstances of the environment's physical conditions.

F- Man's responses to nature do have reciprocal effects. Activities that are performed in the environment have an impact upon the surrounding habitat. The magnitude of these reciprocal effects, which man must in turn encounter, depends upon the broad ecological relationship rather than upon some fleeting or isolated incidences.

*Summary*

-Characteristics, such as *systems* property, *historical* quality, *spatial* interrelationship, and *non-linear* structural properties, of larger ecological systems exist in physiological behavior; the interdependent actions of these characteristics produce an internal resilience and stability (psychologically as well as physiologically) developing forms of adaptation to the changing environmental conditions; adaptation, within tolerance limits occurs basically at two levels: by the efforts of the biological organism and through the *cognitive appraisal process*.

-Maladaptation to changing environmental conditions (or unsuccessful coping with adverse environmental forces) is likely to create a stress state; stress situations arising from primary (viscerogenic) needs are less complex and enigmatic than the secondary (psychogenic) needs; the complexity of stress situations arising from secondary needs is basically due to the fact that these situations do not depend upon the direct impact of stimuli as much as they depend on the stress situations arising from primary needs.

-A brief review of different environments - *thermal*, *atmospheric* and *olfactory*, *sonic*, and *luminous* - affirms the necessity of the individual's control of his environment; studies indicate that not only the physical parameters, but also psychological factors, are important in generating adverse aftereffects; these psychological factors have to do with the *cognitive processes* which affect the efficacy of coping; efficacy of coping is affected not only by the intensity of the environmental force, but also by the individual's appraisal of it and by the type of stimulation (another evidence of the importance of *cognitive processes*);

efficacy of coping depends upon a *competence* level to overcome unpredictability, helplessness, lack of alternatives and choices, and uncontrollability which act as impediments to the coping mechanism; intensity of adverse aftereffects (especially those of a psychological nature) of environmental forces is a function of these impediments, whereas successful coping depends as much upon predictability, controllability, and choice as it does on personality structure and the type and intensity of the environmental force.

-Man's needs and his cultural capacity, the latter being a result of his needs and cognitive ability, generates the "meso-environment" in order to provide terrestrial existence as opposed to arboreal survival; this adaptation process is derived from the faculties of cognitive functioning and man's expanded psychological capacities as a response to the forces of the total (physical, social, psychological) environment; the cultural response to natural (physical) environment occurs fundamentally in two forms: *exploitation* and *relocation*; each form of adaptation is concretely related to specific environmental forces and is limited by the current state of the culture of any society; *exploitation* occurs as man turns available materials to practical use in order to survive, and this transformation process, while bringing about a change in the ecological relationship, tends to reduce the stress states arising from physical environmental forces; *relocation* occurs as man moves his spatial activities from one environment to another in order to maintain a certain balance with the environment and to enhance the ecological relationship; neither form of adaptation is without complexity, nor are they straightforward enough to allow for a cause-and-effect type of explanation for these

adaptation processes; due to their nature these adaptations must be studied within a dialectical framework.

-*Exploitation* is demonstrated by the Anasazi culture of the San Juan Basin; different cultural stages show different housing developments in response to nature; man's impact on the immediate physical environment and the influence of the physical environmental forces on man's building and spatial activity have been shown.

-*Relocation* is viewed through the Paiute Indians of the Owens Valley in California; responses to major changes in the climatic factors takes place with resettlement in a more favorable environment; this movement follows the cycle of the climatic conditions while increasing man's choice and control over the environment.

## Chapter Four

## A CONCEPT OF ENVIRONMENTAL STRESS

## ENVIRONMENTAL DIMENSIONS

For a long time different schools of human ecology proceeded on premises that did not take into account the differences in human behavior either as functions of individual or group dissimilarities.<sup>1</sup> Ecological theory, regarding the character of space and the nature of activities taking place in that space, has been mainly systematized with an economical analysis. That is, the premises on which different ecological perspectives are based were strictly economical in nature.<sup>2</sup> The relation of space to the activities that take place in that space is conceptualized within the limits of impediment and expenditure. According to this conceptualization, the spatial organization imposes certain obstructions which the individual must overcome in order to maintain an equilibrium in his relations with the environment. The individual's effort to overcome these hindrances requires some expenditure, and the individual tries to find a balance between the overtaxing, impeding demands of the environment and his expenditure.

---

<sup>1</sup>See, for example: A. Hawley, *Human Ecology: A Theory of Community Structure*, New York: Ronald Press, 1950.

<sup>2</sup>This has been especially true with the Chicago urban school whose approach is deeply rooted in classical economic theory. Community as a basis, ecological relations (spatial order, growth, land values, etc.) in urban societies were studied with the social forces such as competition, dominance, invasion, and succession. See: R.E. Park, E.W. Burgess, and R.D. McKenzie, *The City*, Chicago: University of Chicago Press, 1925.

However, a close examination of some of the relatively recent studies<sup>1</sup> shows that in reality, the ecological relationship is more than an economic ecology as Firey pointed out almost three decades ago.<sup>2</sup> Individual and group differences, with certain sentiments and symbolism, are also involved in the exchange process that takes place between the individual and the environment.

Another hard pressing issue in human ecology that must be emphasized here is the direct analogy which has been drawn from its biological counterpart.<sup>3</sup> According to this outlook the individual in his problem-solving attempt makes his decisions rationally in order to cope with the overtaxing requirements. The choices made are meant to minimize the harmful aftereffects while maximizing the personal gains and maintaining an equilibrium. This optimization (or rather suboptimization) process that seeks to explain a certain phenomenon is treated not in its entirety, but in part.<sup>4</sup> In addition to the assumptions that are rooted in psychological hedonism, there are also the underlying assumptions of the mechanistic outlook that lead to such a conceptualization.

In attempting to build into the design process a more accurate

<sup>1</sup>For example, see: O. Lewis, *La Vida*, New York: Vintage Books, 1965; H.J. Gans, *The Urban Villagers*, New York: The Free Press, 1962; J.F.C. Turner, Barriers and Channels for Housing Development in Modernizing Countries, *AIP Journ.*, v.33, n.3, 1967, pp. 167-181.

<sup>2</sup>W. Firey, Sentiment and Symbolism as Ecological Variables, *Am. Soc. Rev.*, v.10, n.2, 1945, pp. 140-148.

<sup>3</sup>Hawley, *Human Ecology*, (esp. pp. 41-63).

<sup>4</sup>This type of an approach is quite apparent, for example in B. Fuller's works. The gigantic dome to cover the entire midtown area of New York is designed, according to Fuller, to "fulfill the needs of mankind regardless of natural environment." Quoted in S. Moholy-Nagy, *Matrix of Man*, New York: Praeger Publishers, 1968, p. 13.

representation of this mechanistic approach designers and researchers construct their arguments on certain presuppositions. Fundamentally, it is assumed that: the environment consists of parts, which fit together; the design process may provide the means for a "good" fit; and, once the interaction between man and his environment starts, the consequences can be predicted.<sup>1</sup> Therefore, according to these assumptions, through the component parts of the environment and their ultimate connections, all the phenomena of the environment can be perceived by the individual. Furthermore, claiming to know the working of the whole mechanism, designers not only try to improve the system and accommodate the needs of the people, but also expect certain behavior and actions within predictable limits from the inhabitants.

This is a materialistic point of view. However, it is a *mechanistic materialistic* outlook. Its drawbacks and limitations lie in its reductionistic attitude. All phenomena are reduced to the same system of mechanical interactions. The changes that are acknowledged are merely a repetition of the same kinds of mechanical processes, a cycle of the same changes. Admittedly, this attempt is a slight improvement over the individualistic and idealistic approaches to design. *Mechanistic materialism is not capable of giving an account of the individual's social and psychological activity.*

Contrary to the assumptions of the mechanistic materialist point of

---

<sup>1</sup>For example, see: C. Alexander, *Notes on the Synthesis of Form*, Cambridge, Mass.: Harvard University Press, 1964; R.G. Studer, *The Dynamics of Behaviour-Contingent Physical Systems*, in G. Broadbent and A. Ward (ed.s), *Design Methods in Architecture*, New York: George Wittenborn, Inc. (Architectural Association Paper No. 4), 1969, pp. 55-70; B.C. Brolin and J. Zeisel, *Mass Housing: Social Research and Design*, *Architectural Forum*, July-August, 1968, pp. 66-70.



view, the inhabitants' behavior and actions in an environment are not:

- a) based on changes that are rooted in permanent and stable things with fixed characteristics;
- b) ruled only by changes that occur in the external environment;
- c) always directed toward an optimum in a simplified rational way;
- d) necessarily the results of an ultimate decision;
- e) isolated from the rest of the total environment.

Mechanistic materialism perceives the environment as a complex of existing artifacts and things. However, a more realistic ecological approach must comprehend all the processes involved in the man-environment relationship with regard to the structure of an environment.

*Structure*, here refers to an ordered arrangement of constituent components in a three dimensional space. Therefore, all the elements that form the physical setting are components of the environmental structure. Not only the structural elements themselves are of importance in understanding the environmental phenomenon, but also their relation to each other and to the inhabitants. Spatial organization and quality is determined through these relations which are products of both the euclidean and the topological characteristics of an enclosed space, a micro-environment.<sup>1</sup> While size, dimension, etc. constitute the euclidean properties of a structural element, the topological relationships consist of Gestalt concepts such as proximity, separation, order, enclosure, and continuity.

---

<sup>1</sup>These, needless to say are Piaget's explanation for space conception of children. The theories advanced to indicate the nature of psychological processes required to mediate spatial properties are developed on the findings of Gestalt psychology. See: J. Piaget and B. Inhelder, *The Child's Conception of Space*, trans. F.J. Langdon and L.J. Lunzer, New York: W.W. Norton & Co., 1967, (1948); K. Koffka, *Principles of Gestalt Psychology*, New York: Harcourt, Brace & World, Inc., 1935.

The processes that are involved in the interaction of the individual and the environment are referred to as *exchange processes*. All change interactions that occur through this process take place in a time dimension. Therefore, the structure-process combination has both spatial and temporal characteristics. While structure is a static arrangement of environmental components at a given time in three-dimensional space, the process is a dynamic component of the overall interaction. As a result of an exchange process, structure may change over time. Depending upon the nature of a process (reversible or irreversible), change in the structure, that comes about momentarily with the functioning of the system, occurs accordingly. That is, if the change is very great it usually induces an irreversible change in the structure. The replacement of furniture in a living room is a change of a reversible nature. Whereas, construction of a brick wall for the purposes of making a partition is of an irreversible nature.

Due to the dynamic characteristics of processes, the reductionistic assumptions of mechanistic materialism must be replaced by a materialism that will provide an understanding and the necessary accommodations for the true behavior of the inhabitants. The complexity that is acknowledged but not taken into account by the mechanistic school must be interpreted in its realistic, dynamic meaning. The complexity is not a static one but a dialectical one. Structure without process is a void. On the other hand process without structure is impossible. Processes are not brought into action only by external environmental forces. There are those inner impulses of development in man that set precedents in future actions and behavior. The cognitive,

conative, and affective aspects of the mental process are inherent in all processes. Moreover, changing and developing requirements of mental processes, along with the changing needs, demand a transformation and change in the structure. Neither the changing processes nor the required structural changes have a set ultimate form of co-existence. Instead there is a diversity and a development from lower to higher complexity. This phenomenon does not take place in a vacuum. Neither the process nor the structure are independent units. Therefore, the ecological relationship must be understood between them in their relation and interconnection rather than their being two separate compartmentalized units.

It is contrary to the nature of human behavior and mental processes to think of environmental artifacts as having fixed properties. Structure, the actual physical setting of the environment, comes into being, exists but is not necessarily a permanent fixture of the environment. The development and the process, in which every structural element exists only in connection with other elements, go through several changes and transformations depending on the changing needs of the inhabitants. Changes in needs may occur on short-term basis (e.g. daily) or they may come about in longer terms.

In everyday life there are certain expectations and desires. There are also realizations of these tendencies and inclinations. In a housing environment, just as in a broader environment and in a longer time span, these expectations and desires are not always realized to the level which a person may anticipate. Moreover, there may even be opposing characteristics between the expectations, the physical settings

and the actual occurrences. *Dialectics recognizes that the struggle of the opposite aspects, characteristics, and tendencies of every phenomenon manifests themselves in a unity which leads to further development of the individual's mental process and the transformation of the structural environment.* The essence of the dialectic is the notion that everything is simultaneously united and divided into opposites that are mutually exclusive.

When the individual's cognizant faculties, his competence over the immediate environment, are effectual in coping with the situation, the resulting state is of a nonstress nature. The contradiction in this instance is non-antagonistic in character. Whereas, when a stress situation arises, the contradiction between the expectation, the physical setting, and the realization is antagonistic in character. While non-antagonistic contradictions are necessary for vitality, antagonistic tensions may be averse and harmful.

A mother may desire and expect to be in visual contact with her child who is playing outdoors. Her being indoors may be in contradiction with the child being outdoors, especially when visual contact is not possible. She has to choose between the opposing forces, desire and expectation on one hand and the realization of that need on the other. There is no optimization between the two tendencies. If she decides to continue her work, the worry and persistent concern is constantly in her mind. Neither her cognizant faculties nor her competence over the immediate environmental structures are effectual in this case. An antagonistic contradiction is heading to a stress state, manifested in a constant worry, an aggravation and annoyance, as a result of not

being able to control certain environmental factors.

On the other hand some contradictions can be handled by reducing or eliminating the stress state. Assuming that her mental process insists on the expectation and desire of seeing her child, the contradiction can be resolved by competence (or controllability) over the immediate environment that will provide a visual access between the kitchen and outdoors. Although there still may not be an equilibrium between the expectation, the physical setting and the realization of the immediate goal (that is, a close surveillance in this instance), the mother is not necessarily in a state of stress. Since the task in the kitchen was important enough not to allow her to go out, she is partially achieving both tasks without any serious interruption or annoyance. Although the physical setting is still in opposition with the desire and expectation, competence over the environment or an ability to control certain aspects of the structural elements is sufficient to handle the contradiction. In this instance the contradiction is not of an antagonistic nature.

#### *Structural Dimensions*

In a housing environment the totality of facts, events and artifacts are not only necessarily perceived but experienced as well. Although very difficult to distinguish clearly, the difference between perception and experience, here, is made on the basis of participation. Admittedly, both require a conscious effort to apprehend reality in the immediate environment. Furthermore, neither of them are passive receptions of impressions. However, *experience* denotes a state of being engaged in an activity or participation in an event, whereas

*perception* is referred to as a conscious observation or awareness of the elements of an environment. Yet, both of them are complementary to each other and both are developed in one's life activity with regard to the total environment--physical, social, cultural and psychological. The conditions that make up the experience include not only perceptions and sensations from different perception modalities, but also processes that involve mental activities which are not perceptions.<sup>1</sup> Moreover, one perceives spontaneously before a mental structural analysis is done, while experience occurs successively by an action performed upon the structural elements.

Structural elements that form the environment are both perceived and experienced. They are, in addition to their physical dimensions, built up through generalizations and different levels of experiences. All these properties of structural elements, apart from their actual physical dimensions, are, then, the result of representing phenomena that are the products of mental processes. Obviously, the importance of the representing phenomena, or more precisely, the hierarchy of phenomena, depends upon the hierarchy of needs. For instance, the orientation and location of a couch in a living room may not be as important when one uses it to take a nap as it would be in a small gathering situation. Not only does proximity to other structural elements (such as the wall, windows, chairs, etc.) become more significant in the latter case but its entire topological qualities--continuity, separation, order, etc.--gains an overall importance. Or, one does not think of a window as an

<sup>1</sup>Among many researchers who make a distinction between perception and experience in space are: C. Norberg-Schulz, *Intentions in Architecture*, Cambridge, Mass.: MIT Press, 1965, pp. 22-23; S. Hesselgren, *The Language of Architecture*, Lund, Sweden: Studentlitteratur, 1968, p. 329.

aesthetic phenomenon before needs such as visual communication with the external environment, lighting requirements and security needs that may partially depend on the structural element are gratified and secured.

The dependence of representing phenomena of structural elements upon the hierarchy of needs is in accordance with Piaget's explanation of perceptual and conceptual spaces.<sup>1</sup> *In the case of visual perception, physical dimensions (size, shape, texture, etc.) are recognized through an almost instantaneous structuralization.* Yet this pure and simple perception continues with a perceptual activity augmented by comparisons, transpositions, anticipations and so forth. While effects of simple (mechanical) perceptions remain fairly constant, the effects of perceptual activity are progressively developed as the experiential phenomena develop with time through the everyday activities. Thus, *the perceptual phenomenon that starts with a sensori-motor activity is developed into a conceptual phenomenon with the existence of topological relations and the actions of the individual.* Therefore, the representing phenomena are involved in the whole process as a result of one's experience. The conceptual space constitutes "... a complete reconstruction of physical space, made on the basis of the subject's own actions and to that extent, based originally upon a sensori-motor, and ultimately on a mental representation of space determined by the coordination of these actions."<sup>2</sup> It is apparent from this aspect that the representing phenomena that lead to a conceptual

<sup>1</sup>Piaget and Inhelder, *The Child's Conception of Space*, pp. 451-457:

<sup>2</sup>*Ibid.*, p. 77.

space are by no means mere imitations of the corresponding structural elements but rather the outcome of experiential actions performed by the individuals. Therefore between perceptual and conceptual space, there are systematized actions that are internalized by the individual.

The spatial concepts that the internalized actions or the *schema* present are the results of concrete operations rather than an intellectual abstraction of the properties of structural elements. Piaget's reasons for this phenomenon is that "... thought can only replace action on the basis of the data, which action itself provides."<sup>1</sup> On the other hand, the actions themselves are generally aimed at a certain purpose or goal that must fulfill the satisfaction of a need. Therefore, *the role of the immediate environment in the gratification of a need is both on a physical and a mental level.* That is, structural elements are influencing factors in one's actions and behavior both as physical entities and as the result of mental processes.

Following this argument, it becomes more apparent that one should look at the structural dimensions not merely as elements that make up the perceptual world but also as intervening variables and parameters in one's interaction with the environment in daily life. As needs develop to higher levels (such as esteem and self actualization) the aesthetic qualities, which may be a function of "architectural contradictions" or "tensions" as Venturi argues,<sup>2</sup> may be augmented as high priority parameters of the design process. But first, the "lower" needs must be

<sup>1</sup>Piaget and Inhelder, *The Child's Conception of Space*, p. 453.

<sup>2</sup>R. Venturi, *Complexity and Contradiction in Architecture*, New York: The Museum of Modern Art, 1966.



satisfied before such a step is taken to create a visually gratifying environment. This does not mean that method and phenomenon can be isolated from the ideological content as some would argue.<sup>1</sup> On the contrary, neither can be isolated from the other since they do not exist outside the bounds of each other. As we discussed earlier, qualitative aspects, such as aesthetics, are interpreted as meaningful only after the environmental adequacy has been achieved. Furthermore, this is connected to the superimposed value system which itself is a product of the nature of needs. This, obviously, is not true only for designers but for everyone. Therefore, the layman, the non-designer, has his own sphere of interpretation based upon his own experiences, emerging from his own cognizant faculties. This interpretation does not necessarily coincide with that of the designer. The occupant's interpretation of environmental qualities is not only a function of the pure perceptual phenomenon, as has been emphasized by most designers, but also the product of the occupant's own experiences in that environment.

The enigma of structural dimensions lies in broader problems of a particular understanding and interpretation. For example, problems of standardization and functionalism on one extreme and architectural semiotics on the other have been some of the potential sources for the oppressive environments (especially in realms of housing) which are designed and built. However the concept of functionalism which has had a great impact on modern architectural thought is not a simple one. While function can be interpreted better as subjective and

---

<sup>1</sup>R. Venturi, and D.S. Brown, A Significance of A & P Parking Lots or Learning from Las Vegas, *Architectural Forum*, March 1968, pp. 36-43.

objective, its manifestation in design can also reflect the interrelated types of function. These interrelated types can range from the material needs to psychological and social needs, from expression of structure to the symbolic-monumental function of architecture. Although functionalism in architecture generally has been narrowed down to one or two of the above mentioned interrelated types of functions, it is not uncommon to come across broader views expressed by some of the advocates of functionalism. For instance, the mechanistic dictum of Le Corbusier that "the house is a machine to live in," is somehow broadened by another of his statements which argues that the "... business of Architecture is to establish emotional relationships by means of raw materials."<sup>1</sup> This is a psychological interpretation of function. However, the sincerity of this statement is not very apparent in his projects. Or in spite of all good intentions the verbal commitments did not transcend beyond an architectural semiotics which was so dear to Le Corbusier, one of the most influential figures in the modern movement.<sup>2</sup>

---

<sup>1</sup>Le Corbusier, *Towards a New Architecture*, trans. P. Etchells, New York: Praeger Publishers, 1960, (1927), p. 10.

<sup>2</sup>There is little doubt that Le Corbusier preferred "the Engineer's Aesthetic" to the eclectic form: "If we eliminate from our hearts and minds all dead concepts in regard to the house, and look at the question from a critical and objective point of view, we shall arrive at the 'House-Machine', the mass-production house, healthy (and morally so, too) and beautiful in the same way that the working tools and instruments which accompany our existence are beautiful." *Towards a New Architecture*, pp. 12-13. Nevertheless, in addition to the functional and technological considerations, subjective contributions of the artist and the formal properties of a unified plastic system are of importance: "Beautiful also with all the animation that the artist's sensibility can add to severe and pure functioning elements." (p. 13). His arguments emphasized that "Greatness is in the intention; and not in the dimension". Le Corbusier, *When the Cathedrals Were White* trans. F.E. Hyslop, Jr., New York: McGraw-Hill Book Co., 1964, (1947), p. 26. His design works reflected this much beyond a mere expression of a

A study carried out at Le Corbusier's Pessac some forty years after the project's completion reveals this fact more than the reassessment of any other project done by any designer.<sup>1</sup> In the mid-nineteen-twenties, at Pessac, near Bordeaux, Le Corbusier applied his conceptual work to practice for the first time at a large scale (the Quartiers Modernes Fruges, consisting of some seventy dwelling units). His more general writings<sup>2</sup> and more specifically his conception at Pessac

---

physical milieu. It was a symbol-milieu where the playful combination of mass, surface and light created a meaningful environment. For Le Corbusier, if the intentions did not speak "the language of architecture," one could "transgress the rules of the Plan through an error in conception, or through a leaning towards empty show." *Towards a New Architecture*, p. 11. It is by means of "plasticity" and a "unity of intention" together with "the spirit of order" and "the sense of relationship" that he gives a meaning to his architecture. Talking of the Chapel at Ronchamp (1955), he clearly expressed his intentions: "The Chapel at Ronchamp perhaps shows that architecture is not an affair of columns but an affair of plastic events. Plastic events are not regulated by scholastic or academic formulae, they are free and innumerable." Cited by A. Colquhoun, "Typology and Design Method, *Arena*, June 1967, pp. 11-14. Furthermore, according to Le Corbusier, his architectural language attempts to establish an architectural unity for space-time continuum. Referring to the circulation concept of the Maison la Roche (1923), he said: "This house...will be rather like an architectural promenade. One enters, and the architectural vista presents itself immediately to view; one follows a set route, and a great variety of perspectives present themselves: there is a play of light, highlighting the walls or casting shadows. Bays open onto perspectives of the exterior, and one rediscovers architectural unity." W. Boesiger and O. Stonorov (ed.s), *Le Corbusier et Pierre Jeanneret, Oeuvre Complete: 1910-1929*, 7 Vols; Zurich: Les Editions d'Architecture, 1964, (1929), v.1, p. 60, cited by G. Broadbent, *Meaning into Architecture*, in C. Jencks and G. Baird (ed.s), *Meaning in Architecture*, New York: George Braziller, 1970, pp. 50-75, (p. 57). It is our strong contention that in Le Corbusier questions, particularly with regard to housing, did not find a clear understanding "from a critical and objective point of view," as much as his architectural semiotics found effective means of expression in "plastic events" and in "architectural unity".

<sup>1</sup>P. Boudon, *Lived-in Architecture: Le Corbusier's Pessac Revisited*, trans. G. Onn, Cambridge, Mass.: MIT Press, 1972, (1969).

<sup>2</sup>For example, see: Le Corbusier, *Towards a New Architecture*.

and the statements relating to these concepts, which Boudon documented,<sup>1</sup> disclose what was actually intended: low-cost, standardized, homogeneous, predetermined, cubist structures which would support emotional relations. What is pertinent are the structural dimensions, here, the "cubist structures". Definitely, one expects to find some changes after four decades. But what Boudon describes of the situation today forces one to question the validity and soundness of the theoretical arguments that most of the practical ramifications allow to actualize the structural dimensions:

It seems that everybody has now connected his 'machine to live in' into a 'chez soi'... Not only have the colours disappeared in the vast majority of cases but the 'wide windows' have been made narrower, the patios have been enclosed, many of the original terraces have been roofed over, the empty spaces beneath the stilts have been blocked off, and the great crop of sheds that has sprung up, much to the detriment of the architecture, helps to create a general impression of dilapidation. This impression is sufficiently pronounced for the visitor to feel that, in addition to the normal processes of ageing, there has also been a real conflict between what the architect intended and what the occupants wanted.<sup>2</sup>

Admittedly the study shows mixed feelings and attitudes of the residents about the Pessac project. There are very positive appraisals of the structural dimensions along with some very critical evaluations. Nevertheless, it also very clearly expresses the conflicting aspects of the architect's intentions and the residents' actual needs. Specifically fine structural elements—wide windows, roof gardens, stilts, open facades, and open plan interiors—that constituted Le Corbusier's structural conception, were found to have hampering

<sup>1</sup>Boudon, *Lived-in Architecture*, pp. 29-46.

<sup>2</sup>*Ibid.*, pp. 1-2.

effects. A great mind and a strong advocate of functionalism was being challenged on his own grounds by the layman. Wide windows exposed to hot summer sun for long hours,<sup>1</sup> unprotected and unshaded terraces,<sup>2</sup> homogenetic and identical facades,<sup>3</sup> open areas beneath the stilts<sup>4</sup> and open plan interiors which were meant to create "architecturally satisfactory interiors"<sup>5</sup> have been experienced by the residents in an attitude diametrically opposed from that of Le Corbusier's. This should not be much of a surprise when viewed in the light of the architect's comprehension of duality between "accomodate" and "architecture" in spite of the fact that he himself was disturbed by it.<sup>6</sup> But a result *per se* is inevitable when structural dimensions are apprehended merely as *perceptual* and not as a total *experiential* phenomenon. Furthermore it is difficult (if not impossible) to create accomodating architecturally satisfactory environments when architectural endeavors are believed to exist outside the bounds of those who eventually are affected by that environment.

#### *Complexity of Space*

It was mentioned earlier that the capacity of the perception system is limited, hence the system tends to filter out part of the information before reaching the sense organ. An excess amount of information

<sup>1</sup>Boudon, *Lived-in Architecture*, p. 81.

<sup>2</sup>*Ibid.*, p. 82.

<sup>3</sup>*Ibid.*, illustrations 18-21.

<sup>4</sup>*Ibid.*, illustrations 22-27.

<sup>5</sup>*Ibid.*, p. 123.

<sup>6</sup>*Ibid.*, p. 70.

reaching the sense organs is likely to create a stress state when the individual's coping process is not capable of dealing with the situation. On the other hand evidences from psychological research have shown that lack of information (sensory deprivation, to give an extreme example) may as well put the individual into a stress state.<sup>1</sup> Following this phenomenon, excessively simple and excessively chaotic (sensory satiation) environmental fields may be undesirable. While any perceptual event constitutes potential information, there lies a kind of complexity in between the two extremes--monotony and chaos--which must be the desirable quality of complexity for an environment.

The perception of structural elements is organized beyond the quantitative aspects of environmental cues. The culturally defined value of structural elements as well as socially and psychologically situated needs of the individual are involved in this process. Therefore, the spatial quality (mainly, the complexity) of an environment in addition to the physical properties depends on: cultural values, giving meaning to structural elements in that environment; effects of perceptual expectations; and the social norms that are relevant to the interchange of individuals in that environment. Within this general context, it is assumed that the environment either directly or indirectly gratifies or fails to gratify an individual's need or propensity. Furthermore, environment is viewed as a physical setting which influences (supports or inhibits) various types of interpersonal activities as well as psychological states of an individual.

---

<sup>1</sup>For example, see: J.P. Zubek, *et al.*, Perceptual Changes after Prolonged Sensory Isolation (Darkness and Silence), *Canad. Journ. Psychol.*, v.15, 1961, pp. 83-100; T.H. Scott, *et al.*, Cognitive Effects of Perceptual Isolation, *Canad. Journ. Psychol.*, v.13, 1959, pp. 200-209.

Within the realms of information theory, the meaning of complexity can be understood as some richness in the environment which is desirable. This richness in the environment is a property of the relations among structural components of the environment. Yet, its interpretation by the individual depends on the environmental situation and on the individual's needs and personality structure. Admittedly, complexity is a function of variety, novelty, and diversity. Nevertheless, it is not independent of a person's attributable meaning. Variations among structural elements that make up the physical environment offer the individual a sense of ambiguity. Here, ambiguity is used in the same manner as Fitch uses "inscrutable" to describe the qualitative aspects of the Italian street.<sup>1</sup> The meaning derives from an *experiential feeling* that allows more than one interpretation and a multiplicity of meanings, rather than doubtfulness or uncertainty as they are used in everyday language. The opulent characteristic of environment, that is the complexity of space, results from the feeling of ambiguity.

There is a tendency among some researchers to associate the meaning of complexity-ambiguity or diversity with uncertainty.<sup>2</sup> While it is true that in common usage ambiguity may also mean uncertainty, as mentioned earlier, uncertainty or unpredictability may also cause stress states which are not very desirable. Complexity, as a function of "violated

---

<sup>1</sup> J.H. Fitch, *La Dolce Via, Horizon*, v.4, n.2, 1961, pp. 120-127.

<sup>2</sup> For example, see: H. Munsinger and W. Kessen, *Uncertainty, Structure, and Preference, Psychological Monographs: General and Applied*, v.78, n.9, 1964, pp. 1-24; B. Pyron, *Form and Diversity in Human Habitats: Judgemental and Attitude Responses, Environmental Behavior*, v.4, n.1, 1972, pp. 87-120.

expectations" conceptualized by Rapoport and Hawkes,<sup>1</sup> on the other hand, seems to be a rather narrow interpretation of actual life experiences. Since not only visual characteristics are involved in the feeling of ambiguity, but much broader phenomenon, the abstraction of complexity based purely on mechanistic relations is nothing more than an oversimplified view. Also, as in the case of unpredictability and uncertainty, violations of expectations may lead to stress states as indicated by the examples cited earlier in this study.

Rapoport and Kantor argue that there is an optimal perceptual rate which is related to the opulence and complexity of perceptual input that creates a "good" environment.<sup>2</sup> The optimal perceptual rate is proposed to achieve a happy medium between monotony (sensory deprivation) and chaos (sensory satiation or perceptual overload). However, this conceptualization totally neglects the social and cultural aspects of the environment within which the perception occurs. Although in a later article this concept was abandoned to be replaced by a "psychological dimension capable of reflecting the effects of social and cultural factors as well as subjective ones,"<sup>3</sup> the difference between *intended* and *attributed* meanings of complexity is not recognized. The individual's cognitive processes involved in the interpretation of a situation are somehow avoided in attempts to create a complexity

<sup>1</sup>A. Rapoport, and R. Hawkes, The Perception of Urban Complexity, *AJP Journ.*, v.36, n.2, 1970, pp. 106-111.

<sup>2</sup>A. Rapoport and R.E. Kantor, Complexity and Ambiguity in Environmental Design, *AJP Journ.*, v.33, n.4, 1967, pp. 210-221.

<sup>3</sup>Rapoport and Hawkes, The Perception of Urban Complexity.



which is only the abstraction of the designer. What is attributed to the situation by the layman is not the focal point in the concept mentioned above. Moreover, it is even argued that the designer's perception of environment is somewhat superior to that of the layman.

Complexity and ambiguity are feelings experienced not only as functions of physical properties of the structural components but also as functions of the cognizant faculties of the individual. Therefore, the opposites—simplicity and complexity—do not constitute two isolated compartments (two opposed realities), rather, they are results of the same process of perception and experience. The evidence from psychological research clearly demonstrates a series of transformations in which the inseparable interconnection and struggle of the opposite properties are manifested.<sup>1</sup> Moreover, the results of some tests show that differences in cognizant faculties influence the preference for spaces with different degrees of complexities.<sup>2</sup> These differences in perception and interpretation are attributed to the symbolic aspects of the environment.

The symbolic aspects of an environment are merely the products of the life experience that include needs as well as their satisfaction.

Within the realm of this life experience one becomes conscious of environmental qualities such as ambiguity and complexity. By divorcing

---

<sup>1</sup>D.E. Berlyne, Complexity and Incongruity Variables as Determinants of Exploration Choice and Evaluative Ratings, *Canad. Journ. Psychol.*, v.17, n.3, 1963, pp. 274-290; also by Berlyne, Novelty and Curiosity as Determinants of Exploration Behavior, *British Journ. Psychol.*, v.41, 1950, pp. 68-80.

<sup>2</sup>S.M. Friedman, "Relationship Between Cognitive Complexity, Interpersonal Dimensions, and Spatial Preferences and Propensities," unpublished Ph.D dissertation, University of California, Berkeley, 1969, pp. 78-93.

an environment from the life experience and by focusing merely on purely perceptual characteristics rather than emphasizing the experiential phenomenon, the designer inevitably is assuming that the actual behavior of people is guided by a mechanistic visual activity. It is quite obvious that needs for comprehension and novelty are not the products of pure perception. Exploration and curiosity, which influence the needs for novelty and ambiguity, are the by-products of thought processes and actions involved in the everyday experiences. Therefore, the representing phenomena of structural elements that create a complexity must be viewed within the scope of all the needs.

This argument is connected with an equally important argument about meaning, already presented. The interconnectedness of cognitive meaningful values and social norms, and their relation to needs, are the fundamental determinants of an individual's interpretation of a certain environment. Following this argument then, complexity is not a mechanistic function of the "rate of usable information", as Rapoport and Hawkes have suggested<sup>1</sup> but rather a condition of a dialectical process. The complexity of the resulting experience depends upon:

- a) the relationship between meaning and the impression of a structural element obtained by use of the senses;
- b) the mental condition of the individual *taking part* in that particular environment (not merely an observer);
- c) the ordered complexity of the structural components;
- d) the complexity of the meaning to be processed by the cognizant faculties.

---

<sup>1</sup>Rapoport and Hawkes, *The Perception of Urban Complexity*.

*Degree of Flexibility*

It was assumed earlier that environment either directly or indirectly gratifies or fails to gratify an individual's need or propensity. It was also mentioned that environment is a physical setting which supports an inhabitant's various types of interpersonal activities as well as his psychological state. Since the relation between the individual and his environment that exists within this context is an automatic process and because the individual is not a passive observer from outside, there must be a connection to accommodate and to develop the relation between man and his environment. This connection--flexibility--is another dimension of the environment. Flexibility that exists in an environment is a function of a particular environmental spatial-order. By means of flexibility an environment can provide and accommodate for the changing needs of individuals.

Flexibility of the environment is complementary to the individual's need for comprehension and mastery of the environment. The principle of effectance (the desire to have a direct effect on the environment), which has already been mentioned, derives from the concept of competence--a fitness or ability. White gives a fuller definition:

The competence of an organism means its fitness or ability to carry on those transactions with the environment which result in its maintaining itself, growing, and flourishing. Some parts of the environment must if possible be fought off, but other parts can safely be enjoyed, and still others can be ingested and transformed into materials for self-maintenance and growth. Some organisms are born more or less fully equipped with patterns of behavior that produce effective interactions with favorable surroundings. This is not the case with the higher animals, least of all with man, who has to learn almost everything that is useful in dealing with his world, yet who immeasurably surpasses all other living creatures in his ultimate ability to subdue

and transform the environment to his own use.<sup>1</sup>

In order to achieve the sense of competence, flexibility within an environment is not only desirable but becomes a must. *The higher the degree of flexibility, the higher the sense of competence will be.* This hypothesis is derived from consideration of the different aspects of competence--activity, manipulation and exploration. The motivational principle that lies behind the three aspects of competence is effectance since "... its most characteristic feature is seen in the production of effects upon the environment."<sup>2</sup> Therefore, the support of this motive must be complemented with its counterpart in the environment--the flexibility.

*Flexibility of an environment, then, is the capacity to permit rearrangement, reorganization, and expansion, while maintaining the overall order of the structural components, that is, without implementing drastic and radical changes in the structural components.* The other aspect of flexibility is the *provision of controllability over the environment.* While the first is meant to accommodate the changing needs over a period of time, the latter aspect enhances the individual's coping faculties in particular situations. Flexibility is then a dimension of the physical environment that complements the cognizant faculties of an individual, the freedom to express his very needs in terms of psycho-physical necessity. *The degree of flexibility, then, is the level with which the structural dimensions of an*

---

<sup>1</sup>R.W. White, Competence and the Psychosexual Stages of Development, in R.S. Lazarus and E.M. Opton, Jr. (ed.s) *Personality*, Middlesex, England: Penguin Books, 1967, pp. 142-166, (p. 145).

<sup>2</sup>*Ibid.*, p. 147.

environment can be manipulated and locomoted into, out of and within the environment. It is the degree with which the spatial order of an environment can be perceived and experienced while satisfying the changing needs and providing the necessary environmental means to particular situations that will require more than just the cognitive abilities.

The flexibility requirement emerges out of concrete operations, that is, a series of actions that take place in that environment, rather than mere intellectual abstractions of the spatial-order. Structural dimensions have to adapt themselves to such actions. Needless to say, these actions are mutable within a time dimension. Since a housing environment is a physical setting which is inseparable from the actions themselves, it must respond adequately to the mutability of these actions. In other words, environmental adequacy is a function of all the environmental dimensions, including the degree of flexibility. Therefore, the degree of flexibility, which provides the necessary and timely accommodations to the changing needs, is an important factor that supports or inhibits the unity of idea and material realization of these needs.

When viewed in a dialectical context, flexibility becomes a dimension that provides a means to solve the contradictions that exist between authority and autonomy, between individual and collective, between variety and standardization, between intended and attributed meanings, between exterior and interior spaces, and between changing needs and physical settings that accommodate these changes. Following this dialectical process, then, the issue focuses on the actual provision of

such a flexibility. It is not very difficult to realize that this crucial problem itself resolves into a dialectical relation: the antithesis between completely finished houses and houses that call upon the occupants' actions to bring them to temporary completions. The completely finished house does not leave much choice to the occupant. Whatever mistakes an architect makes in terms of spatial-order become a difficult situation to cope with and to correct. The probability of committing such errors is not very little because of the individual differences of the occupants and the variety of needs and responses to these needs by different occupants. On the other hand, a high degree of flexibility provided in the design process gives a choice to the occupants to respond to their own needs. This does not necessarily mean that the occupants will not make any mistakes themselves. Nevertheless mistakes occurring due to the actions and decisions made by the occupants are much easier to handle than the mistakes existing in completed and perfected housing environments. While the contradictions that may be the result of completely finished housing environments may be more of an antagonistic nature, the contradictions that may arise from the occupants' own mistakes are not likely to be of an antagonistic nature--at least not the same degree of antagonism. The true difference between the two types of mistakes lies in their significance. Mistakes executed by the occupants are of temporal significance and they are the results of certain events occurring in their daily lives or in the actual life process.

Returning to the Pessac project once again, we can very easily recognize the concrete examples of the above discussion. Examples of the need for flexibility manifest themselves anywhere from the

expression of personality<sup>1</sup> to more material needs such as utilization of a space.<sup>2</sup> The residents of Pessac have been able to do a number of conversions since its completion. However, some questions that should be posed are, what degrees of difficulty did they face in conducting such conversions, and in what kind of a time span could they achieve the changes they felt were necessary. The importance of the time element lies in the diachronic nature of changes that demand new spatial arrangements and accommodations. In addition to the synchronic attribute of the physical environment (where the designer's interpretation of the user's needs provides immediate responses to the user's environmental exigencies) environmental flexibility must provide for changes to occur diachronically (where the changes are extended over a period of time not only as a function of the physical environment but also as a function of all the other factors--social, psychological, historical and economical). Then the degree of flexibility emerges as a critical issue. The best examples of this are again seen in the Pessac project: conversions that were done in the interior spaces (with a relatively high degree of flexibility) were much easier to handle than the conversions that were needed on the facades (with a relatively low degree of flexibility) of the buildings.

Granted that open interior spaces which Le Corbusier provided for the occupants were positive aspects of the architect's spatial conceptions as Boudon concludes,<sup>3</sup> there is, however, a contradiction which was not

---

<sup>1</sup>Boudon, *Lived-in Architecture*, pp. 152-159.

<sup>2</sup>*Ibid.*, pp. 113-120.

<sup>3</sup>*Ibid.*, pp. 161-165.

resolved. This is the contradiction between the completed house and the open-ended design. The site architect for Le Corbusier's Pessac project, whom Boudon quotes, expresses this contradiction as follows:

I firmly believe that people don't want to have their houses finished for them. But in Pessac the houses were finished...the houses that have been provided... certainly had a restrictive effect and were likely to pose difficulties. I imagine that the failure of the Pessac project was due to those difficulties, and our professional attitude is lamentable because we are producing architecture, in which we impose our will on our clients; we are in a sense the fascists of the building industry...because we impose predetermined and perfected volumes reflecting an average sensitivity which, however, never reflects the sensitivity of the people who are going to live (in the houses)...

The sensitivity, mentioned here, refers not only to the personal idiosyncracies that occupants may wish to express but to the totality of the need system—from lower to higher needs. These may be elementary and functional needs such as preventing the direct penetration of sunlight through the large windows so that heat in the summer does not scorch the curtains as one occupant complained.<sup>2</sup> They may also be the needs of a higher order—psychological and social in nature—such as the need to express personal identity and some individuality.<sup>3</sup> The achievement of these needs, and others, depends very strongly upon the degree of flexibility that is provided in a housing environment.

---

<sup>1</sup>Boudon, *Lived-in Architecture*, pp. 126-127.

<sup>2</sup>*Ibid.*, p. 81.

<sup>3</sup>*Ibid.*, p. 109.



## A CONCEPT OF ENVIRONMENTAL STRESS<sup>1</sup>

The true nature of space is not absorbed or conceived through the sensory experiences alone. Sensory experiences, for example, relative to color, shape, size, texture, tone, and so forth, merely scratch the surface of spatial consciousness. For any environment and its spatial characteristics to be perceived and to become part of an individual's activity, a sensory experience is interpreted in the light of associations (with symbolic meanings) and eventually registered as a conscious effort of observation. Man's values and attitudes, which are products of his symbolic creative capacity, are also the result of his awareness of his surroundings. This awareness is partially the result of an involvement with the environment—an experiential phenomenon.

Behavior or action is a result of the basic needs and the personality structure of the individual combined with a series of processes of adjustment to different situations and physical conditions. These intervening processes take place between the cognitive processes of appraisal of external stimuli and the activities that man performs which are influenced by that appraisal.

*Human behavior is not merely a passive adjustment process.* Subjective appraisal of the external environment often interferes with our psychological state. A stress may occur as a function of this subjective perception of the environment. This is analogous to the

---

<sup>1</sup>An earlier version of this section was presented as a paper at the Fourth International EDRA Conference. See, M. Turan, *Environmental Stress and Flexibility in the Housing Process*, in W.F.E. Preiser (ed.), *Environmental Design Research*, (Selected Papers, 4th International EDRA Conference), 2 Vols.; Stroudsburg, Penn.: Dowden, Hutchinson and Ross, Inc., 1973, v.1, pp. 47-58.

physiological forms of stress in which there are some traceable changes within the organism such as autonomic disturbances or micro-behavioral reactions due to a discrepancy between the demands of the external environment and the individual's ability to respond to these demands.<sup>1</sup> If our cognitive functioning is disturbed, our behavior pattern will be modified. The physical conditions of the environment are felt socially and psychologically and their concomitant influence has both psychological and physiological manifestations.

To give a wider perspective to the issues that we have been focusing on in this study, a schematic "general behavior model" was presented in Chapter One (see Figure 1.1). Some elaboration on this model has already been made. Here, the emphasis will be on the "internal ecological process" of this model. Previously it was stated that the concern of this study is both with the structure and the exchange process: the structure being the actual physical setting and the exchange process being the interaction between the environment and the individual.

#### *A Conceptual Model of Environmental Stress*

As indicated in our general behavior model, external environmental forces, or the input from the external environment, are the major portion of the stimuli for an individual's actions. During the intervening process, before the action is taken or executed, a

---

<sup>1</sup>Some studies dealing specifically with *environmental stress*, focused on the "physical environmental stressors" with an emphasis more on the physiological consequences on man. For a further discussion see D.H. Carson and B.L. Driver *An Ecological Approach to Environmental Stress*, *Am. Beh'l Scientist*, Sept. 1966, pp. 8-11 and also by the same authors, *An Environmental Approach to Human Stress and Well Being: With Implications for Planning*, Preprint 194, Mental Health Res. Inst., University of Michigan, Ann Arbor, June 1970.

*filtering process* will qualify the characteristics of the input and consequently the behavior in response to that input.

Let us now elaborate on each stage of the internal ecological process. Immediate space in which behavior takes place is defined by Tolman as a "*particularized* complex of perceptions (memories and inferences) as to objects and relations and the 'behaving self,' evoked by the given environmental stimulus situation and by a controlling and activated belief-value matrix."<sup>1</sup>

To be more specific, we can define the immediate space as a group of objects that is perceived by an individual and takes into account their relative orientations and distances. A space in which behavior takes place includes not only the particular objects but also their specific spatial, temporal, aesthetic, functional and other relations to one another.

An input entering this immediate space may have originated in the external environment or it may have been generated in the internal environment. In the first case, the input is more independent of the psychological system than in the second, where the input is more dependent on the state of the system (it may be the product of a feedback). For example, a certain noise coming from outside, from the street perhaps, is an illustration of the first case, and the desire to lie down and relax is an example of the second.

Inputs are neutral and merely informative until they are transformed

---

<sup>1</sup>E.C. Tolman, *A Psychological Model*, in T. Parsons and E.A. Shils (ed.s), *Toward A General Theory of Action*, New York: Harper and Row Publishers, 1962, (1951), pp. 279-361, (p. 296).

into *loads*. This transformation occurs due to a subjective appraisal of the input as a threat situation. Broadbent's *filter theory*, in which a biased selection of the nervous system acts upon the input, supports the concept of this transformation.<sup>1</sup> To illustrate this input-load transformation, we can expand our noise-from-the-street example: A person is sitting in a room and reading, not being particularly bothered by a sound (e.g. low frequency, continuous) coming from the street outside. The sound changes suddenly from low to high frequency, reaching a disturbing level.<sup>2</sup> At this point, the new sound (noise) causes the filter to select the auditory information and the noise temporarily replaces the information in the book as input to the perceptual system. A neutral input (the initial sound) has been transformed into a load (noise), causing distraction and perhaps even annoyance.

This appraisal process occurs after the input has reached the immediate behavior space. To understand this process clearly and to aid us in describing our stress model, the definitions of certain concepts will be stated. In order to construct our model, we will draw upon the physical stress concept both for analogies and terminology.<sup>3</sup>

Since we have differentiated between an input and a load, let us define precisely what an *environmental load* is: any input that has the

<sup>1</sup>D.E. Broadbent, *Perception and Communication*, New York: Pergamon, 1958.

<sup>2</sup>The disturbance effect of high frequency sounds compared to low frequency ones has been illustrated in numerous studies. See, for example: D.E. Broadbent, *Effects of Noises of High and Low Frequency on Behavior*, *Ergonomics*, v.1, n.1, 1957, pp. 21-29.

<sup>3</sup>A brief explanation of physical stress-strain relationship is given in Appendix A.

capacity to be a threat to the maintenance of a system, to its range of stable equilibrium, harmony or adaptiveness, and which threatens the achievement of a state to which some process is directed. The word "threat" has been used by most stress researchers in its more generally accepted meaning, suggesting damage, destruction, injury, menace, etc. Due to reasons that will be apparent when we define the concept of 'environmental stress', we need to expand the idea of threat so that it will include less dramatic and traumatic events such as, annoyance, discontent, disruption, distraction, general uneasiness, and so forth. Some examples of environmental loads in the housing situation are: the inability of a mother to be in visual or verbal contact with her child while she is in the house and the child plays out of doors;<sup>1</sup> inadequate acoustical insulation of the sleeping areas of a house;<sup>2</sup> the lack of visual privacy from the outside;<sup>3</sup> inappropriate layout of different areas of a house in terms of their function; a lack or excess of natural light coming into the house at a specific time of

---

<sup>1</sup>Three of the many studies that emphasize the visual and verbal contact and children's play habits in housing complexes are: I. Reynolds and C. Nicholson, Living Off the Ground, *Architects' Journ.*, v.150, 1969, pp. 459-470; A. Stevenson, E. Martin, and J. O'Neill, *High Living: A Study of Family Life Living in Flats*, Carlton, Victoria: Melbourne Univ. Press, 1967; L.E. White, The Outdoor Play of Children Living in Flats: An Enquiry into the Use of Courtyards as Playgrounds, in H.M. Proshansky, W.H. Ittelson, and L.G. Rivlin (ed.s), *Environmental Psychology*, New York: Holt, Rinehart and Winston, 1970, pp. 370-382.

<sup>2</sup>Most of the studies on acoustics range from physiological effects to social and psychological consequences and there are also those which treat the sound from purely physical point of view. For the social and psychological effects, see L. Kuper, Neighbor on the Hearth, in H.M. Proshansky, W.H. Ittelson, and L.G. Rivlin (ed.s), *Environmental Psychology*, New York: Holt, Rinehart and Winston, 1970, pp. 246-255.

<sup>3</sup>*Ibid.*

day; a lack of privacy within a dwelling;<sup>1</sup> and, inadequate space for large-scale socializing.<sup>2</sup>

*Environmental stress* is a state which occurs when the individual is subjected to environmental load(s). Environmental stress arises from the appraisal process as a result of the perception, cognition and conation of the individual. All the information received by the individual from the environment at that specific moment, is utilized or modified, depending upon the qualities of the personality structure and the particular need of the individual at that time and place.

The intensity of the environmental load is generally measured against a hierarchy of needs.<sup>3</sup> Alternative paths to goals can be evaluated against these needs. Of course, this pattern does not always lead to a rational choice, as is often assumed by architects in creating a "rational" design. The actions that people choose to undertake are not of a mechanical character but rather they involve much more complex processes. This is especially true once the primary needs are gratified. That is, as the need system is operating at higher levels, such as levels of belongingness and love needs, esteem needs, and self-actualization, the choices made or the wishes and desires of individuals take on a much more complex course of events. This

---

<sup>1</sup>V. Hole, *Social Effects of Planned Rehousing*, *Town Planning Review*, v.30, July 1959, pp. 161-173; J. Plant, *Some Psychiatric Aspects of Crowded Living Conditions*, *Am. Journ. of Psychiatry*, v.9, n.5, 1930, pp. 849-860.

<sup>2</sup>M. Fried and P. Gleicher, *Some Sources of Residential Satisfaction in an Urban Slum*, *AIP Journ.*, v.27, n.4, 1961, pp. 305-315.

<sup>3</sup>Earlier in this study (Chapter One) the *need system* was conceptualized as a set of interconnecting domains, each domain corresponding to a different order of the hierarchy of needs.

complexity is the result of a development that involves not only the satisfaction of the individual physiological needs but even more important, it involves those aspects of the total social consciousness which depend upon the interconnection of need, meaning and value. Lazarus expresses this phenomenon as follows: "... irrationality and maladaptiveness does not come primarily from the intervention of emotions in thought processes, but rather from the fact that threat places the psychological system in jeopardy and that alternatives for coping with threat are tied to motives, beliefs and expectations concerning the situation, which differ from person to person."<sup>1</sup>

Some form of housing is necessary to satisfy some of man's basic needs such as protection from the extreme loads of the external environment. However, the process is not terminated with the fulfillment of the physical environmental requirements. The gratification of lower needs makes it possible for higher needs, as mentioned earlier, to emerge and become predominant. This is basically the result of the interdependence of the environmental conditions and the cognitive, conative and affective aspects of man's mental process which is partially dependent upon the environmental dimensions. Admittedly the higher needs are not as strong in the sense that the lower ones (e.g. sex, hunger, fear, etc.) when intensely aroused. However, they are persistent and require favorable conditions for non-stressful adaptations.

It can be said that stress is partially a subjective phenomenon. Its

---

<sup>1</sup>R.S. Lazarus, *Cognitive and Personality Factors Underlying Threat and Coping*, in S. Levine and N.A. Scotch (ed.s), *Social Stress*, Chicago: Aldine, 1970, pp. 143-164, (p. 162).

sources lie in the physical, physiological, psychic, and social events or demands. As was mentioned earlier, it is arrived at either externally or internally. It can have a specific state as well as a diffuse state. Since stress underlies both adaptive and maladaptive behavior,<sup>1</sup> we can conclude that it is not always harmful but may even at certain times provide a positive support in reaching a particular goal.

Following this line of thought, then it is apparent that the phenomenon of stress, just like human behavior in its entirety, cannot be viewed as if it were uncausative. The multicausal and multivariate nature of stress can be clearly seen when one looks at the factors involved in this process. These factors may range from the nature of the input, the environmental variables, the variety and magnitude of resources available, the spatial-temporal relations to the individual's faculties and potentials that depend on the psychological system, motivation toward relevant goals and purposes, past experiences, and the degree of uncertainty that the person anticipates for that particular event. While it is difficult to single out any one of these factors as the determining parameter, the subjective perception of specific or non-specific inputs as threatening can be the common denominator in the appraisal of a stress situation.

*Environmental strain* is the result of stress and the ineffective coping with a particular load. It is not independent of the load or the stress. It is the indicator of the joint result of the load and the concomitant stress which manifests itself by the deformation of a

---

<sup>1</sup>B.P. Dohrenwend, The Social Psychological Nature of Stress; A Framework for Causal Inquiry, *Journ. Abnormal and Soc. Psychol.*, v.62, n.2, 1961, pp. 294-302.



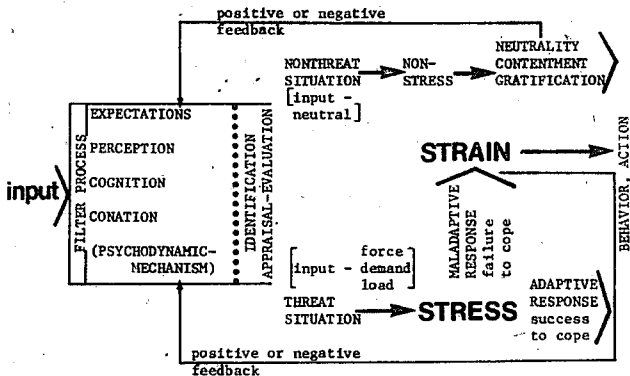
structure, or in the displacement or deflection of the boundary of stability. Some examples of environmental strain are: discontentment with the spatial arrangement of a house; distraction while reading in a room; annoyance caused by noise coming from neighbors; the emotional (in a negative way) attitude toward the texture and color of a wall; worrying about one's child who cannot be seen from the window inside the house, and so forth.

In the physical stress-strain relationship, it is explicit that within the elastic range (without exceeding the elastic limit) a substance can be loaded, unloaded and reloaded without giving rise to a permanent deformation. At each loading the stress-strain curve will be identical. This behavior, needless to say, is not true for the stress-strain relationship with regard to the man-environment interaction. Admittedly, every stress does not cause a considerable strain (say a pathological case) which can be the equivalent of a permanent deformation. However, analogues of those strains that do not cause a deformation on a physical object may very likely produce sufficient effect on the individual that may become crucial with regard to his well-being, if not his health. Therefore, the actual stress-strain relationship that is pertinent to the man-environment interaction is a very crucial factor in the exchange process that takes place between man and his environment. This relationship is the environmental flexibility--a property of the physical environment. (See Figures 4.1 and 4.2 for schematic representation of the stress-strain model.)

#### *Environmental Flexibility*

The relationship between stress and strain in a physical substance

is a characteristic of that particular material. The ratio of stress to strain equals the *modulus of elasticity* of the material. According to this constant, the behavior of the material in terms of deformation, elasticity, plasticity, fatigue, etc. under various loads, will differ. This constant of proportionality determines the nature of the curve between stress and strain in the elastic range.



-positive feedback increases deviation of output from a steady state.  
 -negative feedback decreases deviation of output from a steady state.

Figure 4.1  
 PSYCHOLOGICAL SYSTEM - INTERNAL ECOLOGICAL PROCESS

Without further delineating the physical stress model,<sup>1</sup> let us state our analogous stress-strain model considered in environmental terms: we shall introduce the concept of *environmental flexibility* (EF) analogous to the modulus of elasticity. Environmental flexibility

<sup>1</sup>See Appendix A.

(EF) is a variable related to a particular environmental-spatial order. It affects the magnitude of the environmental strain pertaining to the environmental aspects of a particular load which may put the psychological system into a stress state. Essentially, it is the ratio of environmental stress to environmental strain, pertaining both to the environmental qualities and their physical and socio-psychological attributes. Thus, strain, the outcome of the stress syndrome, is directly dependent upon the stress and indirectly dependent on the EF. In other words, the lower the flexibility of an environment under a constant load or stress, the higher the strain due to that load (the converse being, the higher the flexibility, the lower the strain).

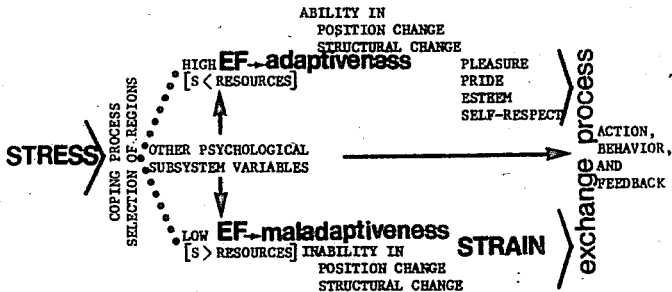


Figure 4.2  
STRESS - STRAIN MODEL

S: stimuli  
EF: environmental flexibility

A high EF will exist in an environment that is more responsive to change, that is more capable of variation and modification. The flexibility of an environment is its capacity and readiness to yield to the influence of the inhabitants. Degrees of flexibility can be expressed by attributes such as adaptability (the capacity to be

modified or altered), adjustability (the willingness for correspondence or harmony without being radically changed), and the faculty of accommodation (specific or momentary adaptation). *It is our central hypothesis that those strains which are results of environmental attributes of a specific spatial order, can be reduced in proportion to the degree of flexibility of that environment.*

Adaptability, adjustability and accommodation (capacities in an environment) permit it to respond to the required changes generated by the needs of the inhabitants. Varying degrees of flexibility are required, going from higher to lower levels of responsiveness depending upon the demands made by the need system of the residents. While the accommodation capacity of an environment responds to more immediate and momentary needs, such as rearrangement of the bedroom setting or control over external forces (e.g., sun, wind, noise, etc.), adjustability and particularly adaptability are capacities that respond to needs demanding relatively more permanent manipulations and restructuring of the environment. These latter changes may amount to a restructuring of the spatial arrangement, the addition of extra space, an extension to the balcony or the porch, etc. These degrees of flexibility are not only necessary for mere efficient utilization of the space but also to help overcome, at least partially, the alienation phenomenon that inhabitants face with regard to their own immediate environment. A lack of flexibility leads not only to stress situations due to the utilization of space but also to stress situations that may arise from the absence of means to personally identify with the immediate environment. Therefore, EF implies more than mere accommodation for the functional use of a space.

*Flexibility*, then, is a characteristic of the physical environment that provides a series of alternatives for the inhabitants to control the environment according to their needs. That is, flexibility makes it possible for the inhabitant to have a "freedom of choice" with regard to his immediate environment. Proshansky points out the importance of such a quality of our environment with regard to the individual's higher needs:

Freedom of choice implies that the individual can exert some control over his physical setting, and in this regard we are confronted with the growing concern over *human territoriality*. Individuals not only lay claim to "privacy" for themselves as corporeal objects, but for the things they own, the spaces they occupy, and their so called "personal effects." ...objects, spaces and places are extensions of the individual's self--they may be elements of his self-identity--and in this sense he and only he can determine who besides himself--if anyone at all--will use them, change them, or even view them. It is in this sense that I have recently written about "place-identity," that aspect of the person's self-identity represented by actual and desired physical settings that help to establish who he is and what he is.<sup>1</sup>

Flexibility can be analyzed from two different but related points of view. One view is the *utilization of a given space*, wherein the action systems (at a higher level) and activity patterns (at a lower level) are important. Behavior patterns or episodes<sup>2</sup> in their

<sup>1</sup>H.M. Proshansky, *Environmental Psychology and the Design Professions*, in *Architecture For Human Behavior: Collected Papers from a Mini-Conference*, Philadelphia Chapter, AIA, November 1971, pp. 15-22, (pp. 18-19).

<sup>2</sup>In their study, where "episode" (or behavior pattern) is accepted as the basic unit of analysis, F.S. Chapin and H.C. Hightower refer to it as "a reasonably homogenous interval in the life time of an individual, an interval of time which is devoted to a single dominant purpose." (p. 8). See their study: "Household Activity Systems--A Pilot Study," Center for Urban and Regional Studies, Inst. for Res., in Soc. Science, UNC, Chapel Hill, May 1966.

aggregate can make up an activity and their distribution and smoothness in time and space can affect the individual's internal ecological process. The inability to utilize a given space, according to a particular need at a specific time, will affect the series of behavior patterns that follow.

The second aspect of flexibility pertains to the *quantity of available space*. Here, we are concerned mainly with the changing population of a household and changing needs with respect to the spatial-structural requirements. The growth and shrinkage of a household can be expressed in changing requirements for physical space. The first aspect of flexibility, the utilization of a given space, is considered as occurring in the short range future, in which immediate alterations and accommodations are necessary. The second or quantitative aspect can be considered as occurring in the long range future, where the alterations and accommodations are neither immediate nor urgent, but ultimately necessary.

Short-term requirements may include the following: the rearrangement of furniture for a temporary social gathering; the utilization of the dining room or area for the temporary functioning of different household activities (e.g. ironing, studying, etc.); using the living room as a sleeping area; using the bathroom as a dark room; and so forth. Most of these examples illustrate multi-functional usage of certain defined areas. Some may require major structural changes (removal of a wall or addition of a partition) while some may require only minor rearrangements (moving furniture, or changing the position of decorative artifacts on walls, tables, etc.).

The long term aspect of flexibility already mentioned can pertain to

the changing population over time in a household, which presents significant problems for house design. Different stages of a household present new and different demands in the realm of space arrangements. People normally do not move successively to a different home each time there is a major change in spatial requirements. Therefore, flexibility, which would allow *free movement* and alternative uses of space in the house, becomes a priority. These changes can occur not only when the size of the family becomes greater or smaller but also when certain necessities demand rearrangement of living space. An example of the latter is that at first it is essential to have the baby's room near that of his parents', but when the child gets older it often becomes desirable to offer him more privacy with a room further away from the parents'. While a toddler may need supervision during play and sleep activities, the school-age child may require a certain amount of seclusion from the rest of the household. Flexibility is of great importance in such instances and the potential for it must be provided if rearrangement is to take place.

Our emphasis on EF is due in part to its importance in the coping process. If the stress state has been established, the coping process--secondary appraisal<sup>1</sup>--starts functioning in the situation and attempts to reduce or eliminate the anticipated threat. The coping processes are dependent upon the cognitive processes of appraisal. It is also

---

<sup>1</sup>R.S. Lazarus differentiates primary appraisal from secondary appraisal based on the sources of information contributing to these two sequential phases: primary appraisal--based on nature of harmful confrontation; secondary appraisal--based on consequences of action tendencies. The issue with primary appraisal is the magnitude of the threat or non-threat situation. Whereas the issue in secondary appraisal is the effectiveness of the coping process. *Psychological Stress and Coping Process*, New York: McGraw-Hill Book Co., 1966, (esp. pp. 160-162).

very likely that the coping processes are affected by spatial influences. The faculty to have control, to manipulate, to manage or to rearrange space, can influence the "effectance" of the coping process. Similar to Lewin's concept of "locomotion"<sup>1</sup> (change of position; change of structure), the environmental aspects of the coping process may reduce or eliminate or on the contrary promote the achievement of a certain state toward which a process is directed.

The coping process, pertaining to environmental stress, may involve either a change in one's position or a change in the structure. As was mentioned earlier, the constituents of behavior space, orientations and distances, may be other than spatial. This gives the coping process temporal, social, mechanical and other qualities to manipulate. This hypothetical construct, which is an intervening variable within the internal ecological process, acts as a bridge between the behavior of an individual from one region of behavior space to another.<sup>2</sup> A psychological region is a component of a life space, according to Lewin's definition. Therefore, everything that characterizes the situation which affects the psychological system can be represented as a physical or psychological region. The possible behaviors that can occur in a situation are dependent on the past experiences of the individual and his personality structure, as well as upon the presence of objects, i.e. the immediate environment. The process of coping involves selection from several perceived and available regions which will result in the particular behavior or action. It is not the behavior or the action itself.

---

<sup>1</sup>K. Lewin, *Principles of Topological Psychology*, New York: McGraw-Hill Book Co., 1963, pp. 93-117.

<sup>2</sup>*Ibid.*, pp. 41-75.



In addition to the utilitarian demands for new regions, there are also personal, idiosyncratic reasons or desires to change the position of or to alter a physical region. For instance, the desire to study in the dining area rather than in one's room, or the housewife's desire to rearrange the living room furniture, or the wish to reorganize the decorative artifacts in the display area, or addition of some more flowers to the windowsill, or the novel arrangement of lighting fixtures, and so forth will all require some degree of flexibility from the spatial-order.

The demands or desires arising from needs higher than basic drives or needs of a utilitarian character construct a field of forces (or "valences"<sup>1</sup>) in the environment that act upon the individual. This field acts between the individual and any psychological object, be it a physical object, an episode, an activity, a situation, or a goal. Valences are the manifestations of different values; they are the subjective perception resulting from the interaction between the individual's need system and the environment at the moment. As the needs and concomitant demands or desires of the individual change, the collection of all the forces in the field and the environment changes, too. While the state of the person may modify the valences, environmental dimensions may give rise to conflicting situations between the valences and the possibilities that exist in the environment. EF acts as a tool for the individual to reduce or eliminate the stress situation that may arise from such a contradiction--on the one hand the demand resulting from a need and on the other, the environmental

---

<sup>1</sup>K. Lewin, *A Dynamic Theory of Personality*, New York: McGraw-Hill Book Co., 1935, pp. 80-113.

condition that may not be in accordance with that particular demand.

Admittedly, EF is a basic property of the spatial order. However, it is also a function of the valences of the situation. In other words, the degree of flexibility is partially dependent upon the particular valences in that situation. The possibilities and difficulties that the environmental conditions may present are the results of the combined action of the valences and the physical environment. Nevertheless, the failure of the environmental conditions to support or meet a demand affects the individual's coping process more directly than the demand itself. Therefore, a low degree of EF will tax the coping process and cause a stress situation. The stress state and the resulting strains are not as much the result of the valences themselves as they are the result of a lack of ability to do something in support of the valences. Stated more unequivocally, *the coping process is affected more by the state of not being able to control and manipulate than by failure to meet the requirements of the situation.*

Our main interest is in the ability to alter or manipulate the structure of a given environment when confronted with a stress situation. EF plays a significant role in all exchange processes that occur between man and his environment and it is one of the dynamic properties of a situation.

It has been emphasized by numerous students of personality development and motivation that the *motility urge* and *exploratory drive* are integrated functions of ego development.<sup>1</sup> As mentioned earlier,

---

<sup>1</sup>See, for example: H. Hartmann, Comments on the Psychoanalytic Theory of the Ego, *The Psychoanalytic Study of the Child*, v.5, New York:

the concept of competence has been proposed by White to explain an individual's capacity to interact effectively with his environment and to fulfill the motility urge and the exploratory drive. According to White's argument, the urge toward competence is inferred particularly from behavior that has the characteristics of motility, exploration and experimentation.<sup>1</sup> Hence the dynamic properties of a situation arising from actual life experience and the individual's capacity to have effectance over the environment leads to a general dynamic trend in the individual. This dynamic trend of an individual leads toward an increase of autonomy.<sup>2</sup> This characteristic tendency toward self-determination and self-expansion is to resist and cope with the external forces of the physical and social environment in their own domain of influence.

EF with regard to such a tendency provides the means for the autonomy that is needed to have effectance over the environment. Hence, *environmental flexibility is a dynamic property of the physical environment which assists the autonomous capacity to be involved with the environmental dimensions.* Since in man very little exists innately and so much has to be acquired through experience and need system to deal with the environment, EF can be conceived as one of the

---

International Universities Press, 1950, pp. 74-96; A. Kardiner and H. Spiegel, *War Stress and Neurotic Illness*, New York: Hoeber, 1947; B. Mittelmann, Motility in Infants, Children, and Adults, *The Psychoanalytic Study of the Child*, v.9, New York: International Universities Press, 1954, pp. 142-177.

<sup>1</sup>R.W. White, Motivation Reconsidered: The Concept of Competence, *Psychological Rev.*, v.66, n.5, 1959, pp. 297-333.

<sup>2</sup>A. Angyal, *Foundations For a Science of Personality*, New York: Commonwealth Fund, 1941.

prime factors in the effectance motivation and as having a high value in the adaptation process. The desire to achieve an objective grasp of the environment by means of a certain flexibility, however, is not merely a result of the tendency toward bodily expansion. The tendency which requires such a flexibility is basically a derivative of the competence concept which is integrated in motivation. White explains it as follows:

It is...that man, with his mobile hands and abundantly developed brain, attains an extremely high level of competence in his transactions with his surroundings. The building of houses,...the making of tools and instruments, the domestication of plants and animals, all qualify as planful changes made in the environment so that it comes more or less under control and serves our purposes rather than intruding upon them... Man as a species has developed a tremendous power of bringing the environment into his service, and each individual member of the species must attain what is really quite an impressive level of competence if he is to take part in the life around him.<sup>1</sup>

EF, also is closely connected with the temporal state of the individual. A person can behave differently at different times in the same environment as a result of the cognitive process of appraisal. This is not only a property of the structure but also of the exchange process between man and his environment. In other words, *flexibility is a linkage between the cognitive process of appraisal and the structure of a situation.*

In a broader scope Lewin makes use of a similar concept: "degree of fluidity", covers the whole of the psychological system.<sup>2</sup> To him a "situation is the more fluid the smaller the forces which are necessary,

<sup>1</sup>White, *Motivation Reconsidered: The Concept of Competence*, p. 324.

<sup>2</sup>Lewin, *Principles of Topological Psychology*, pp. 159-162.

other conditions being equal, to produce a given change in the situation."<sup>1</sup> Since our argument for EF in the stress-strain relationship is parallel to Lewin's concept of structural changes, except at a lower level, we can say that EF is included in the "degree of fluidity" or it is a subset of fluidity.

Outside the limits of ergonomic and anthropometric requirements, and beyond the ranges of "personal space"<sup>2</sup> and "territoriality",<sup>3</sup> a freedom of movement must be provided for the individual, that is, a freedom to move within an environmental order according to the choices and selections of the individual. This is another component of EF. In other words, EF affects the quality and the quantity of operations necessary to move freely, to have a choice in the spatial arrangement and to modify the spatial-order. The elimination or reduction of the "excessive adjustive burdens"<sup>4</sup> is provided by the EF through this freedom of movement.

The inability to adapt to new *situations* is a highly influential factor on the attitudinal attributes (cognitive, evaluative and affective). On the other hand, this aspect of the exchange process definitely is a design controllable element that can be furnished through the *environmental flexibility*. Our intention is not to conclude that

---

<sup>1</sup>Lewin, *Principles of Topological Psychology*, p. 159.

<sup>2</sup>R. Sommer, *Personal Space*, Englewood Cliffs, N.J.: Prentice-Hall, 1969.

<sup>3</sup>E.T. Hall, *The Hidden Dimension*, Garden City, N.Y.: Doubleday/Anchor, 1969, (1966).

<sup>4</sup>A.L. Schorr, Housing and Its Effects, in H.M. Proshansky, W.H. Ittelson, and L.G. Rivlin (ed.s), *Environmental Psychology*, New York: Holt, Rinehart, and Winston, 1970, pp. 319-333.

environmental flexibility is the only factor in alleviating such a complex problem, nor would we wish to assert that man-built environment is the sole determinant in people's attitudes and behavior. But at least our observations and assessments of real life situations (especially of architect designed housings) incline us to believe that much more consideration and attention must be given to this aspect in the design process if we want the living environments to assist the inhabitants in their coping process with the environmental loads that create stress states. Promotion of this type of flexibility in the housing process may aid the inhabitants in their coping process.<sup>1</sup>

*Summary*

-Environmental dimensions--*structural elements, complexity of space, and degree of flexibility*--must reflect and be in accordance with the dialectical nature of life activity as opposed to a mechanistic materialistic outlook; the dialectical nature of ecological relations, which are in a continuous change, must be incorporated into the design process in order to be a support system to man's existence, i.e. to his physical, social and psychological activities which result from his concrete relations to the environment; in terms of design, this complex relationship between man and environment must be recognized and implemented in the *structure*--ordered arrangement of constituent components in three dimensional space--of an environment; quantitative and qualitative aspects, which include a temporal dimension of the man-environment relationship, are manifested in the *exchange processes*--interaction of the individual and the environment--and these processes

<sup>1</sup>Concept of *environmental flexibility* is delineated further, with special reference to squatter housing, in Appendix B.

must be supported by the structural dimensions; as opposed to the reductionistic assumptions of mechanistic materialism, the design process must take into account the cognitive, conative, and affective aspects of the mental processes which require changes within the environment as needs and demands are modified with time.

*-Structural dimensions* are not only perceived but also experienced; since the role of the immediate environment (particularly of a housing environment) in the gratification of a need is both on physical and mental levels, structural dimensions, e.g. size, orientation, proximity, etc., must be considered not merely as elements that make up the perceptual world but also as intervening variables and parameters in one's daily activity; reassessment of Le Corbusier's Pessac housing project is used, here, to show the importance of structural dimensions in a housing situation and also to emphasize the fact that conceptualization (mental level) of space is not the result of abstract thinking but of concrete relations.

*-Complexity of space* derives from an experiential phenomenon; the individual's cognitive processes are involved in the interpretation of a situation, therefore the concept of complexity is not an abstraction of the designer but a condition of a dialectical process which emerges from the interconnectedness of cognitive meaningful values and social norms, and their relation to needs.

*-Degree of flexibility* is the level of controllability and changeability that an environment offers to its users; flexibility is complementary to the individual's motivation for competence; flexibility of an environment is that characteristic which provides the necessary means to resolve the contradictions that exist between authority and autonomy, between individual and collective, between variety and standardization,

between intended and attributed meanings, between interior and exterior spaces, between changing needs and physical settings that accommodate these changes; it is an intervening element of design that distinguishes the completed house and the open-ended design.

-Within a general behavior model, the *internal ecological process* consists of filtering and appraisal of the environmental input which is then either perceived as neutral or transformed into a *load*. This perception depends upon both the structure of the environment and the *exchange process* between man and environment.

-*Environmental stress* is a state resulting from both the physiological and psychological loads of the environment.

-Stress is rationally or irrationally coped with and often a hierarchy of needs is employed during this intervening process; failure in coping leads to *strain*.

-An environmental stress-strain model is developed which is analogous to the physical stress-strain relationship.

-The main thesis, that the environmental flexibility is a most important factor affecting the coping process is presented.

-*Environmental flexibility* is the variable facility to change the utilization of given space or the quantity of available space.

#### *Propositions*

1. *Environmental stress* is a state intervening between the constraints of the environment and the resulting efforts to reduce these constraints.
2. The intensity of *environmental stress* varies directly with the external and the internal *environmental loads* associated with that particular stress.



3. *Strain*, the indicator of *environmental loads* and the stress state, manifests itself through annoyance, discontent, distraction, general uneasiness as well as in more dramatic ways such as harm, destruction, total or partial dysfunction, etc.
4. The probability of maladaptive responses (leading to strain) due to *environmental stresses* varies directly with the intensity and duration of those stresses.
5. The intensity of *environmental strain* varies inversely with the *environmental flexibility*.
6. Greater *environmental flexibility* increases the resources of the individual to cope with the *environmental load* in that situation.

## Chapter Five

## IMPLICATIONS ON THE HOUSING-DESIGN PROCESS

The failure of mechanistic materialism, as already discussed, has been a failure to recognize the true character of basic actuality in human beings. The basic actuality--*human involvement in the life process*--is active, not passive in character as assumed by the advocates of mechanistic materialism and their followers involved in the design process. The dialectical nature of life activity builds upon a consciousness which is nothing other than material human activity or *praxis* as defined in Hegelian-Marxian concepts. *Praxis*, originally a Greek term meaning action and doing, is used to denote the performance of activities or the exercising of an art. However, it is distinguished from the mere production of an artifact in the sense that the performance of a particular activity must be done properly and well, in accordance with the needs so that those needs are gratified. Here, the use of *praxis* is not meant in its more restricted sense, to be ethical or political in character (only applicable to the sphere of the *polis*), but, in its broader meaning including the daily activities in the satisfaction of basic human needs; it is applicable, also, to the sphere of household

---

<sup>1</sup>For an elaborate discussion of *praxis*, in particular the Hegelian-Marxian concept of *praxis*, see: R.J. Bernstein, *Praxis and Action*, Philadelphia: University of Pennsylvania Press, 1971, (esp. pp. 11-83); also, S. Avineri, *The Social and Political Thought of Karl Marx*, Cambridge, England: Cambridge University Press, 1968, (esp. pp. 124-149).

(*oikia*) and family. Furthermore, the distinction between the social and the political realms seems to be an abstraction contrary to the actual life activity, especially in the modern world, since one is a function of the other. "In modern world," as Arendt writes, "the two realms indeed constantly flow into each other like waves in the never-resting stream of the life process itself."<sup>1</sup> This life process, material human activity, is not merely "practice" (in its common usage), which assumes a narrowly defined character denoting a mechanistic behavior and action leading to something external to and indifferent to the nature of the person practicing; rather, it is an action that determines the very nature of a man; furthermore, it is self-activity wherein the products and artifacts produced become concrete and integral parts of this activity (i.e. objectification).

Any design process that does not take into account this essential productive dimension of human activity—*praxis*—is apt to repeat the mistakes of the design processes which eventually lead to stress states. Therefore, the alternative to the existing design methods, intuitive or rational, must include the full comprehension of *praxis* in order to understand and recognize the full range of man's cognitive activities which are developing constantly through his interaction with the surrounding environment.

Human cognition and consciousness are not the outcome of an act of individual will or arbitrary convention. Rather, they are related to the evolution of man's daily needs as manifested in his social life. Man's practical relation to the structural elements (artifacts and

<sup>1</sup>H. Arendt, *The Human Condition*, Chicago: University of Chicago Press, 1958, p. 33.

other objects in our daily living) and the total environment he confronts are the underlying factors for understanding man's cognitive perspective of his surrounding. The environment which man encounters, desires to explore, tries to control, and uses to fulfill certain satisfactions, does not exist independently of his relation to it. It is true that human consciousness and the practical mind do not produce existence, but produce an existence of man as a *social being*. Also, it is true that man finds the environment already constructed and differentiated. However, his perception of this environment does not occur "...according to some alleged natural classification but according to a classification imposed by a practical need for orientation in one's environment."<sup>1</sup>

The very roots of basic actuality appear to be missing in the notions and assumptions upon which most of the present design methods are built. In most of the recent design processes the idea of environmental adequacy has been abused and vulgarized in such a manner that it falls short of fulfilling some of man's needs. It also does not provide ways and means for the coping processes. The unavoidable consequences are alienation and stress. The understanding of the basic actuality and its translation into design language is far from sufficient to create an environment in which

...man appropriates to himself his manifold essence in an all-sided way, thus as a whole man. Everyone of his human relations to the world--seeing, hearing, smelling, tasting, feeling, thinking, perceiving, sensing, wishing, acting, loving--in short all the organs of his individuality, which are immediately communal in form, are in appropriations of the object in their *objective*-relation

---

<sup>1</sup>L. Kolakowski, *Toward a Marxist Humanism*, trans. J.Z. Peel, New York: Grove Press, 1968, p. 46.

or their *relation to it*. This appropriation of human actuality and its relation to the object is the confirmation of human actuality.<sup>1</sup>

If it is true that environment influences man's alienation phenomenon, then the abstract possibility of a non-alienated man-environment relationship only becomes a real possibility through the "confirmation of human actuality", i.e. environmental means provided for *praxis*. Neither the physical being nor the cognitive being of "whole man" can achieve this actuality without the "continuing dialogue between human needs and their objects."<sup>2</sup> This dialogue, called *praxis* is the result of an effective interaction between man and his external environment which thereby becomes *adequate* for man. Therefore, *environmental adequacy* becomes a necessary tool in the "confirmation of human actuality." *Environmental adequacy* is that character of an environment in which human needs are emphasized in the design elements and thus the objectification of design is achieved in a humanized nature. The humanized nature of the environment can only be established by means of providing the necessary *environmental adequacy* which will enrich the tools for *praxis*.

Admittedly, the primary dimension of alienation for Marx is socio-political; the psychological dimension is only secondary and derivative.<sup>3</sup> Nevertheless, the external environment is subjectively and objectively influential upon the functioning of the ego and this aspect cannot be

<sup>1</sup>K. Marx, *Writings of the Young Marx on Philosophy and Society*, trans. and ed.s L.D. Easton and K.H. Guddat, Garden City, N.Y.: Doubleday/Anchor, 1967, p. 307.

<sup>2</sup>Kolakowski, *Toward a Marxist Humanism*, p. 66.

<sup>3</sup>Bernstein, *Praxis and Action*, pp. 48-49.

neglected if the whole man is considered. While ego development takes place as a process of increasing differentiation between the ego and environment, an activity or an environmental dimension--structural elements, the complexity of an environment, and flexibility--gain importance in their own right as they go through a change of function over the years.<sup>1</sup> The change of function, which occurs as a result of the development process and the experience of the coping mechanisms, plays an important role in the perception of the surrounding environment. The change of function is constantly influenced by the need system and the environmental conditions relevant to that particular need. An individual's attitude towards his environment is at least partially shaped with a basic emotional orientation--*relatedness*--in the environment. *Relatedness* is a phenomenon that totally depends on the type of interaction that prevails between man and his environment. For instance, the intimate *relatedness* that existed for the primitive man hardly exists for the present-day man who rarely experiences a richly meaningful interaction with the external environment. This unhealthy psychological alienation from the external environment definitely is a derivative of social, political, and economic dimensions of the estrangement phenomenon, but its importance in man's perception, interpretation and coping process is critical enough not to be neglected or bypassed in the design process. Searles lists some psychological benefits which derive from a mature *relatedness* with man's environment: the assuagement of various painful and anxiety-laden states of feeling; the fostering of self-realization; the

---

<sup>1</sup>H.F. Searles, *The Nonhuman Environment: In Normal Development and the Schizophrenia*, New York: International Universities Press, 1960, pp. 72-73.

deepening of one's feeling of reality; and the fostering of one's appreciation, and acceptance of one's fellowmen.<sup>1</sup>

Only an understanding of the true nature of the relationship between man's psychological and social needs and structural space can provide us with a designed environment that is conducive to mental health or simply to man's well-being. One of the ways in which a person perceives the organization of a housing environment is through the psychological functional relationship of inner and outer spaces. This is processed through the individual's cognitive facilities which depend upon factors within the personality system--past experiences, immediate needs, present psychological condition, etc. Therefore, only a design goal that takes into consideration all aspects of the individual's existence can achieve the requirements of an environment that will "...guide the inevitable interaction of structured space and man in meaningful and beneficial patterns," and "permit an interaction which will contribute to mental health rather than to tension and frustration."<sup>2</sup>

Having stated this as the goal of a design process, let us elaborate on the effectual relationship of man's consciousness and design consciousness. Man's consciousness, as already mentioned, can only be acquired through a *praxis* in which man has control over his environment. This is not only necessary to overcome or to reduce the stress states, which may be the direct result of an unsuccessful coping process, but also necessary to surmount the alienation phenomenon, particularly those

---

<sup>1</sup>Searles, *The Nonhuman Environment*, p. 120.

<sup>2</sup>C.B. Moller, *Architectural Environment and Our Mental Health*, New York: Horizon Press, 1968, p. 143.

dimensions of alienation resulting from the environmental conflicts. The concept of alienation has aided us in seeing the dialectical connection between the consciousness and environmental reality from an ecological perspective. Just like the objectification of the design process depends upon *praxis*, alienation also heavily draws upon *praxis*. Although alienation is a form of objectification<sup>1</sup> --historical and social setting or environmental conditions are such that man's products gain a mastery over him and dehumanize him--the emphasis, as Marx stated, "...is placed not on the state of objectification but on the state of alienation, estrangement and abandonment, on the fact that the enormous objectified power which social labour has opposed to itself as one of its elements belongs not to the worker but to the conditions of production that are personified in capital."<sup>2</sup> Then, the critical issue in design objectives is not to promote one isolated aspect of design to bring certain "reforms" to the misconceived design goals in order to achieve objectification as is done presently, but to generate the widest possible range to support the *praxis*.

What man does in his daily activity within a setting, be it labor conditions or an environmental situation, is his consciousness and self.

Bernstein echoing this Hegelian-Marxian claim writes:

Consequently the very nature or character of a man is determined by what he does or his *praxis*, and his products are concrete embodiments of this activity. In an alienated society man is not only alienated from

---

<sup>1</sup>For a more detailed explanation of the distinction between alienation and objectification see: Bernstein, *Praxis and Action*, pp. 42-50; and Avineri, *The Social and Political Thought...*, pp. 96-105.

<sup>2</sup>K. Marx, *The Grundrisse*, trans. and ed. D. McLellan, New York: Harper and Row Publishers, 1971, p. 150.



the products he shapes, but the very activity by which he produces these objects is itself alienated. Man is alienated from his fellow men as well as from himself. More perspicuously, all alienation can be understood as a form of self-alienation. Alienation does not result from the fact that man objectifies himself, produces objects--this is man's distinctive character. Alienation results when he produces in such a way (conditioned by political economy in which he finds himself) that his products are at once an expression of his labor-power and at the same time are not a true expression of his potentialities...<sup>1</sup>

The critical issue, here, is the *utilization of man's potentialities and his faculties as required by the active nature of basic actuality*. While on one hand this type of *praxis* is bound to reduce his alienation from the environment through direct participation and involvement, on the other hand the utilization of an individual's potentialities and faculties is definitely bound to increase the capacity of his coping mechanisms. A situation that leads to such a *praxis*, where the individual can decide on alternatives, where he has a choice to make, where, in actuality, he himself can control or manipulate his environment, is also a much more effective way for the individual to respond to his needs. "This means," Goodman writes, "creating design situations where people no longer feel compelled to emulate the aesthetic values of the latest architectural tastemakers, but are free to explore their own environmental needs."<sup>2</sup> The primary question concerning this issue is not the extent to which actual involvement conforms to reality, i.e. what the designers conceive as real needs and real responses to these needs, but the extent to which such an environment elicits behavior

<sup>1</sup>Bernstein, *Praxis and Action*, p. 44.

<sup>2</sup>R. Goodman, *After the Planners*, New York: Simon & Schuster, 1971, p. 199.

appropriate to the material needs and situations of people themselves.

There is definitely a contradiction between the dynamics of social, psychological, and physical demands made upon people and the static nature of the built housing environments they inhabit. While the constantly varying requirements of the need system necessitate change and complexity in the physical environment, the static nature of most "designed" housing environments offers rigidity and simplicity. This contradiction arises from the simple but significant difference between the *process*--life activity--and the *product*--the house, as it is perceived by most designers. *Process* is a continuous operation marked by advancement and gradual changes that lead toward growth or development, whereas *product* is a finished, static entity assuming a rigidity that does not allow any flexibility over a period of time.<sup>1</sup>

How can this basic contradiction be resolved? The answer to this question must be sought within human actuality. Therein lies an awareness, or consciousness that is in fact the *praxis*, the human activity. This phenomenon is a gradual process of intensification of consciousness

---

<sup>1</sup>J.F.C. Turner gives an eloquent argument on the difference between product and process in his *Housing as a Verb*, in J.F.C. Turner and R. Fichter (ed.s), *Freedom to Build: Dweller Control of the Housing Process*, New York: The Macmillan Co., 1972, pp. 148-175. Emphasizing the importance of individual autonomy in the housing process, he writes: "On the one hand, we will have, as we commonly do have, supralocal agencies which plan for and provide for people's housing needs with the result that the people so planned for and provided for turn into consumers or passive beneficiaries. On the other hand, if housing is treated as a verbal entity [i.e. as a process], as a means to human ends, as an activity rather than as a manufactured and packaged product, decision-making power must, of necessity, remain in the hands of the users themselves. I will go beyond that to suggest that the ideal we should strive for is a model which conceives housing as an activity in which the users--as a matter of economic, social, and psychological common sense--are the principal actors." pp. 153-154.

which presupposes movement and action taken in response to needs. Environment, particularly the housing environment where man is supposed to have shelter, rest, leisure, solitude, and comfort must not only be in congruence with man's *praxis* but must also provide a supportive system for his actions and movements. Therefore, any design process that provides for the exigencies of actual life activity must have its own consciousness. This design consciousness must be understood within the context of the forms of physical, social and psychological *praxis*. Only such a design consciousness can accommodate the realization of human actuality which generates from the material needs as opposed to ideal and quixotic models. Within the scope of these material needs a design process can become unified with the actual life process. Only then can the contradiction, between the process of human activity and the house as a product, be resolved. Maldonado explains this relationship between the actual life process and design as a dialectical contra-position:

The alternative to the abstract utopia of ideal models cannot be possibilistic capitulation; rather, it must consist in the overcoming of that false alternative by means of a "general theory of design *praxis*." Such an organic complex of criteria directed toward innovative action should help us to generate a fruitful relationship between "critical consciousness" and "design consciousness" within the specific context of recent capitalist society. Or, to put it in another way: it will help generate a fruitful relationship between, on the one hand, the exigencies of the "critical consciousness," which cannot stop being critical without ceasing to be consciousness; and, on the other hand, the exigencies of "design consciousness," which cannot abdicate its will to perform without ceasing to be design: between the positive negativeness of criticism and the negative positiveness of design.<sup>1</sup>

---

<sup>1</sup>T. Maldonado, *Design, Nature, and Revolution: Toward a Critical Ecology*, trans. M. Domandi, New York: Harper and Row Publishers, 1972, pp. 67-68.

The preceding chapters underscore the importance of cognitive factors in coping with the effects of stress situations. *The uncontrollability of environmental loads appears to be a major factor in the unsuccessful coping processes.* It is not important in the sense of pathological consequences. However, annoyance, insecurity, irritability, discomfort and uneasiness, as results of ineffective coping, are not negligible. Furthermore, these strains are diametrically opposed to the purposes of a housing environment. It would appear, then, that the attitudinal attributes--evaluative, cognitive, and affective--which depend heavily upon environmental situations are related to behavior and action systems in a negative way in the presence of strain. Even more important than their negative effect on behavior is their long term influence on an individual's motivation and well-being in general. This, eventually, becomes a problem of adaptation.

Here, it might be useful to consider the problem as a *conflict between the cognitive activity of the individual and the reification of the design process.* Strain is a function of the load intensity. Yet it is also dependent upon environmental flexibility. Contextual variables, such as uncontrollability and unpredictability are the main factors that influence the cognitive activity. They too are functions of environmental flexibility. While the cognitive activity and reification of the design process (through environmental flexibility) are the results of one and the same dialectical process, they can also be opposing elements. Because of this process one becomes conscious of environment and becomes an active part of material reality.

What design elements positively support man's cognitive faculties in

his coping process? As mentioned earlier, "effectance" (the desire to have a direct effect on the environment) is an important part of motivation. The competence concept that emerges from this motivational factor is part of the coping mechanism. Structural elements and the flexibility of the particular environment are the environmental elements that form a support system to cognitive faculties. Structural elements--window openings, furniture, shutters, etc.--are of relatively a static character. Flexibility gives a dynamic character to the environmental elements. Therefore, the flexibility provided in the design process is the predominant characteristic of an environment that is effectual in the dialectical relation of an individual's cognitive activity and reification of the design process. Through flexibility one's capacity to cope can transcend beyond the limits of personality structure, the major construct of the coping mechanism.

#### *Proposal*

The present level of technology is physically equipped to produce housing components that will provide the required flexibility and the desired individual autonomy in the housing process. Numerous examples around the world give clear evidence of the fact that industry is capable of producing housing or housing components even at very sophisticated levels. A permanent structural skeleton equipped with stationary wet-core areas (kitchen and bathroom) can very well, for example, be enclosed by an industrially produced skin system.<sup>1</sup> The design can provide sufficient room for the enveloping skin to be

---

<sup>1</sup>A similar scheme has been proposed by N.J. Habraken. See his, *The Supports and the People: The End of Housing Project*, Amsterdam: Scheltema & Holkema, 1961.

expanded, shrunk, and changed.<sup>1</sup> Through conscious design and technology such a *praxis* can be provided to the individual. Through such a housing environment an individual can reduce environmental stresses by means of the flexibility provided for him and increase his autonomy and freedom of action in his housing environment.

Terner, in his article "Technology and Autonomy," views industrialization as a composite process with four different aspects: 1. systematization and standardization of products; 2. specialization of labor; 3. concentration of production and marketing; and 4. mechanization of production.<sup>2</sup> His recommendation stresses the first two aspects and suggests the abandonment of the last two, which involve heavy investment

---

<sup>1</sup>A housing project within the lines described above is underway in Montereau-Surville in France. This experimental building that requires the participation of occupants in shaping their housing environment is based on the assumption that different families exhibit different degrees of adaptations. This real life experiment, set up by the Anthropology Department of the University of Paris, involves families from high income brackets, professionals and civil servants. The participation of the family is encouraged by means of modular movable wall panels with which a family can set its outer boundaries and arrange the internal layout according to its needs. Some families have adapted certain prototypes suggested by the designers and some have defined their own boundaries and internal layouts. There have even been cases where some families changed the arrangements often to experiment with different possibilities. Since the experiment has started recently (1970), no publications concerning this novel environmental experience (novel, at least for the people in the upper income bracket, since this type of environment is very well known to the squatters of the developing countries) are available yet. Personal correspondence with Dr. A. Coblenz, Director of the Center for Study and Research of Applied Anthropology, University of Paris.

<sup>2</sup>I.D. Terner, *Technology and Autonomy*, in J.F.C. Turner and R. Fichter (ed.s), *Freedom to Build: Dweller Control of the Housing Process*, New York: The MacMillan Co., 1972, pp. 199-237, (esp. pp. 216-222); for a more elaborate analysis of industrialization in the housing process see, also: I.D. Terner and J.F.C. Turner, *Industrialized Housing: The Opportunity and the Problem in Developing Areas*, The Ideas and Methods Exchange (IME) Series, n.66, Dept. Hsg. and Urban Dev., Office of International Affairs, Washington, D.C.; Gov. Printing Office, July 1971.

and high-risk strategies. Although the reasons for concern over this "partially industrialized manufacturing process" seem to be valid for economies, where investments and profits are the only measuring sticks, they are questionable from the viewpoint of flexibility that has been described in this study. A flexibility that is proposed to resolve the conflict between product and process requires not only systems design and labor specialization but also production concentration and mechanization. The construction process of squatter settlements, which are relatively flexible but which are deficient in certain requirements, such as sanitation, physical design, etc., are already built on the concept of "partially industrialized manufacturing process."

It would appear, then, that the problem does not lie as much in the investment-profit concerns and the level of technology as it does in the *correct utilization of present technology* and in the *correct handling of production distribution*. A design consciousness and an appreciation for the value of *praxis* could very effectively make use of the "enormous productive capacity of industrialized products which would expand people's creative range for manipulating their environment."<sup>1</sup> This is not to say, however, that a blind faith in advanced technology is the answer.<sup>2</sup> It should not be overlooked that

---

<sup>1</sup>Goodman, *After the Planners*, p. 209.

<sup>2</sup>Most students of housing seem to view the problem from a very narrow perspective, mainly that of a technological point of view. Furthermore, supremacy of a technologically advanced country, for these people, appears to be a solution in itself. Talking about the possibilities and benefits of the utilization of mobile industrialized housing in the urbanizing areas of developing countries, M.J. Drury writes: "It is evident that much can be learned from the American experience with mobile industrialized units that has implication for useful implementation in developing countries.... Provision of movable housing would provide better control of "marginal areas" or squatter settlements in these

some of the most rigid and dismal housing environments are the fruits of that very advanced technology. Again, however, the problem is not in technology itself but in preference, imagery and experience shared by the architects, contractors, builders and investors over the last half century.<sup>1</sup>

The flexibility to expand, to shrink and to change is needed for the reason that a family's needs are not very predictable over a long period of time. This is even more true in the social and psychological domains where environmental needs are almost impossible to define exactly due to the great complexity involved in the whole life process. It is true that certain projections can be made over the size of a nuclear family.<sup>2</sup> But even for this type of change, flexibility to expand or shrink becomes a necessity within its own right to provide the required spatial organization. This argument is presented with regard to the dynamic nature of human activity--*praxis*--where the need system becomes more difficult to define in exact terms as the needs climb up in their hierarchical order. Also, it is a fact that

---

new cities... When there is a limited housing supply and limited resources and when reuse of urban residential land seems inevitable, as is the situation in the urbanizing areas of developing countries, as it appears that a mobile industrialized housing unit is a sound solution." *Mobile Homes: The Unrecognized Revolution in American Housing*, New York: Praeger Publishers, 1972, p. 158; For more on the subject where technology is thought to be the solution for housing problems in developing countries, see, also; S.C.A. Paraskevopoulos *et al.*, *Structural Potential of Foam Plastics for Housing in Underdeveloped Areas*, Ann Arbor, Mich.: Architectural Res. Lab., University of Michigan, 1966, (esp. Section 8).

<sup>1</sup>N.J. Habraken, *The Act of Dwelling*, *Architects' Journ.*, v.147, 1968, pp. 1187-1192.

<sup>2</sup>N.N. Foote, *et al.*, *Housing Choices and Housing Constraints*, New York: McGraw-Hill Book Co., 1960, pp. 98-99.



even within the physical requirements of spatial organization a change occurs over time. Following this, we propose that the design requirements in housing be divided into two sub-categories: *constants* and *variables*.

Under *constant requirements* we can subsume those domains which include sets that do not change or show very minute variations over time and from location to location. The forces of external environment such as climatic factors (earth-sun geometry, wind, rain, etc.), structural requirements, topographic conditions, for example, belong to this sub-category. Under *variable requirements* we can subsume all the domains of a behavioral set--social and psychological. The domain of any function is an arbitrary set of elements. While primary needs--physical and biological--fall into the category of constants, secondary needs--psychological and sociocultural--belong to the category of variables. It is understood by now that all these domains that include the various sets, interact, and that they are not significantly connected to each other except with reference to the whole (the systems property of the dialectical process of life activity).

The interaction of physical and biological requirements--primary needs--results in a demand for *shelter*. Here, the physical requirements are more critical as far as the control of hierarchies go. Biological needs require the necessary utilities that satisfy the needs for both nurture and elimination of wastes, which are sets of the biological domain in general definitive terms. The consideration of only the constant constraints is an extremely mechanistic materialist approach. Therefore, along with the constants, variable requirements must be included in a

more comprehensive approach. The inclusions of variables require certain quantitative but mostly qualitative attributes of all the spaces that have been provided for the constants.

As indicated in the previous arguments, not all the requirements are consistent and uniform either in one's life span, or in a longer time span. Due to the changes in man's development, requirements carry different hierarchies of obsolescence. Responses to constants usually have a longer life span and they can function with uniformity without much loss in effectiveness. Whereas, responses to variables cannot function with the same quantitative and qualitative effectiveness they have started with. Therefore, the actual formation of the dwelling unit that belongs to the two main sub-categories must be separated. The skeleton and the wet-core belong to the constants and the detachable skin units, which define the boundaries (external and internal boundaries), belong to the variables. This separation provides the adaptive type of design in which the dynamic interaction of systems and organizations is allowed adjustment to short term fluctuations, as well as to long term or major changes in external and internal movements.

The variables being highly indeterminable and uncertain (at least they are not yet efficiently measurable quantities), the spatial organization required or desired by man should be determined by man's own preference. The masses should not be forced to live in the personalized product of the architect. A house should be *personal* not to the designer but to the inhabitant. The latter should be able to imprint his own individuality. The dynamic aspects and continuous changes of *praxis* should reflect their

characteristics on man's immediate surroundings, particularly on the housing environment. For this reason the environment of the occupant should be changeable. A freedom of association should be provided through such a flexibility.

A flexibility in terms of growth and shrinkage is one aspect of the problem. A flexibility, where the components themselves and their interrelations can be changeable, is the other aspect. The latter requirement emerges from the "action-complexes" of a household activity. Norberg-Schulz explains this phenomenon as follows: "The form... is often determined by the fact that most functions consist in a series of actions which are connected with different places (locations). The functional frame has to adapt itself to such *action-complexes*."<sup>1</sup> The variables that affect the behavior of the family members change continuously within the process of the family's growth and shrinkage. The "action-complexes" require new spatial organization due to the changing demands of life activity. Due to the uncertainty and variety of the variables (plus the fact that each man carries his own idiosyncracies), the detachable units cannot form predetermined volumes. They have to be skin-boundaries with which man can set up spatial organization depending upon *his* spatial requirements and preference.

The skeleton, the actual structure, can be built to provide an open space to give flexibility to the user in order to determine his own desired space. The floors, even in multi-story buildings, can serve the function of lots--*floor-lots*--where an individual can claim part

---

<sup>1</sup>C. Norberg-Schulz, *Intentions in Architecture*, Cambridge, Mass.: MIT Press, 1965, p. 115.

of it as his own, and form his own space-volume with the various standardized detachable skin-boundaries. When a change becomes necessary (a change in the family size, an undesirable attitude towards the previous space organization, a better and more efficient way to develop and produce skin-boundaries, etc.), it can be provided by the detachable units. While skeletons and wet-cores respond to the constants, the skin-boundaries respond to the variables. Due to a longer life-span, without the loss of efficiency, skeletons need not be changed as often as the skin-boundaries. On the other hand, skin-boundaries, due not only to the requirements of the variables but to technological advances as well, may need to be replaced and changed.

Through this housing process, the dynamic nature of human activity is recognized in the architectural services, hence man is focused as the goal and the objective to be served. Man's alienation from his immediate surroundings--housing environment--is at least reduced since he is contributing to and determining his own environment, instead of someone else doing this for him. Man is left to satisfy his own idiosyncracies rather than having to feel and experience those of someone else who decided for him. At this point, the task left for the designer is to search for the best fitting dimensions for the skeleton, to provide alternatives in detachable units and to lay out the complex of buildings.

It would appear, then, that the professional's task is to deal with the responses to constants and leave the responses to variables to the users. At this point the stress-strain model presented in the previous chapter can be a tool for the designer. From the viewpoint of ecological

relations (natural, social, cultural, and psychological parameters) a stress-strain analysis involving all the factors (constants and variables) of the housing process can bring to light those factors which the designer can deal with effectively without imposing any *a priori* spatial-organization and the aspects of the housing design process should be left for the user to determine. Although it is unavoidable for the designer not to deal with the variables at all (the skeletons themselves and the complexes of buildings, due to design features, definitely influence the variables), the scheme of skin-boundaries and the passive control elements of design, i.e. the elements of environmental flexibility, will offer the user more potential to cope with the stress situations that may arise due to environmental forces.

Following this argument, there emerges a hierarchy of design considerations with which the designer must be involved. First, due to his professional skills all those aspects related to *natural environmental forces* are determined by the designer. These include those physical aspects of design such as, orientation, size, structural considerations, determination of materials and so forth. Secondly, the other *environmental considerations* with regard to sensory activities--thermal, olfactory and atmospheric, sonic and luminous--must be dealt with not only with respect to their physiological importance but also because of their general psychological significance. Thirdly, *socio-cultural aspects*, in a most comprehensive way, must be taken into consideration. While the first two design considerations emphasize a concentration upon the individual dwelling, the third one is focusing more upon the design and layout of the buildings. Of course, this is not to say that the general layout of buildings does not have anything

to do with the consideration of natural environmental forces and other environmental considerations nor does it say that the design determinants emerging from natural and other environmental forces do not influence the socio-cultural forces. Other influencing factors such as economy and level of technology are not omitted on purpose but thought to be intrinsic with the socio-cultural aspects.

Briefly, what is being proposed is the separation of the actual physical structure of the building from the socio-psychological space requirements. This is done not because they are not interrelated but because the synthesis of the two can be achieved at a more effective level in the actual process. Decisions that will determine the structure and the wet-core are more valid over a longer period due to their very small loss in efficiency. The uncertainties in the decision-making process, for the personal spatial organizations, place the designer in a difficult situation, one in which he imposes his own criteria upon the people for whom he is designing. This, we very strongly believe, should be left to the inhabitant. Instead of trying to choose from many alternative behavioral patterns of different individuals (since all cannot be utilized by one decision maker), this choice or preference given to the individuals can initiate their behavior which will reduce the deviations between real life situations and the desirable states. In other words, an increase of choice will enhance the coping mechanism and as a result reduce stress states arising from environmental forces. It is a problem of the self-regulating process. The conflicts that may arise can be brought to a synthesis, i.e. the disturbance menacing the continuation of the desirable state (load causing a stress state) will be neutralized. The adjustment process

should be an inclusion of the self-regulating criterion.

## APPENDIX A

PHYSICAL STRESS MODEL<sup>1</sup>

External forces acting on the surface of a body cause internal stresses in that body. External forces are mainly of two kinds: static (e.g., the dead load of a body due to gravitational forces) and dynamic (e.g., wind load). The internal stresses which are generated by forces are also dependent upon the area of the body to which the force is applied. Hence, the stress on a surface is defined as the ratio of the vector force ( $F$ ) to the surface area ( $A$ ) that it is acting upon. Then the stress is a function of the force ( $F$ ) acting on a surface area

(A):  $\sigma = \frac{F}{A}$ , where  $\sigma$  is the average stress on  $A$ . Both the vector  $F$  and  $\sigma$  have magnitude and a direction which can be resolved into components: the normal force or normal stress components (i.e. perpendicular to the surface) and the tangential force or tangential stress components (i.e. parallel to the surface). While the normal components of stress refer to basically two types of stresses—*compressional* and *tensional*—the tangential stress component is known as the *shear* stress. In addition to these three basic stresses, there is also a *torsional* stress.

<sup>1</sup>For a more elaborate explanation of stress-strain relationship in physical materials one may consult some excellent books written by specialists on the subject. See, for example: G.W. Housner and T. Vreeland, Jr., *The Analysis of Stress and Deformation*, New York: The Macmillan Co., 1966, (esp. pp. 1-73); R.C. Juvinall, *Stress, Strain, and Strength*, New York: McGraw-Hill Book Co., 1967, (esp. pp. 17-95, 167-192); F.L. Singer, *Strength of Materials*, New York: Harper & Brothers, 1951, (esp. pp. 1-38); S. Timoshenko, *Strength of Materials*, 3rd ed.; Princeton, N.J.: Van Nostrand Co., 1957, (esp. pp. 1-69).



Compressional and tensional stresses tend to deform the body mainly in the axial dimension. Shear stresses tend to cause displacement in a direction orthogonal to some axial dimension while torsional stresses tend towards angular displacement along an axial dimension.

The deformation or displacement of the substance in a body, as a result of the stress generated by the external force, is called *strain*.

Regardless of the magnitude of the stress, there is always a corresponding strain no matter how infinitesimal it may be. In other words, theoretically, the force (or load) and the resulting stress cause a corresponding deformation or displacement in that body. Unit strain is the ratio of the deformation or displacement in linear dimension to the original dimension:  $\epsilon = \frac{\Delta d}{d}$ , where  $\epsilon$  is the strain (amount of deformation the body undergoes due to the action of  $F$ ),  $\Delta d$  is the change in the linear dimension,  $d$  is the original dimension of the portion of the body under consideration.

There are fundamentally two types of strains: temporary and permanent. Temporary deformation, that is deformations that only last during the time when the load is being applied, take place within the range of an initial stage known as the elastic range of the material. When a body is loaded, stresses and deformations will be produced. Upon the removal of the load, if the body resumes its original form, the body is said to be *elastic* or the stress-strain relationship is said to be in the elastic range. Within this range, stress and strain are in a linear relationship. In other words, the strain (deformation of an elastic body) is proportional to stress, within the elastic range. This is the theory of elasticity or better known as Hooke's Law. The proportionality

constant,  $E$ , is the Modulus of Elasticity, (or Young's Modulus of Elasticity).

The second type of deformation—the permanent deformation—occurs beyond the elastic range of the material. After the body is loaded, stresses and accompanying strains will be produced, as mentioned already. Upon the removal of the load, if the body does not resume its original form, the body is said to be *plastic* or the stress-strain relationship is said to be in the plastic range. In the plastic range, the linear relationship of stress-strain, which is true for the elastic range, is not true anymore. That is, once the stress exceeds the elastic limit of the material, the body goes into the initial stage of the permanent deformation in which, upon the removal of the load, the body cannot completely resume its original form. This point is known as the yield stress.

Up to the yield stress, the behavior of most materials is more or less similar. The only big variation between the behavior of the materials within the elastic range is due to the different modulus of elasticities that each material has. Thus the slope of the stress-strain curve is dependent upon the material characteristics. This constant proportionality, which was already mentioned in Hooke's Law, is different for each material. For example, the modulus of elasticity of steel is greater than that of concrete which is greater than that of wood. Material-a, shown in Figure A-1, has greater Modulus of Elasticity ( $E$ ) than materials b and c.

Figure A-1 represents a generalized stress-strain curve rather than an idealized one. Ranges shown in the figure are: OE - elastic range,

$EE'$  - elastic limit, and  $E'P$  - plastic range. Although the stress-strain relationship in the elastic range is assumed to be linear, in actuality this is not true. But the actual stress-strain curve is so close to a linear relationship that it is generally accepted as a direct proportionality. On the other hand, in the plastic range ( $E-P$ ) there is a nonlinear functional relationship between stress and strain. If the stress exceeds point  $E$ , the body will have a permanent deformation even after the removal of the load. This behavior will continue all the way to point  $P$  - the ultimate strength of the material. The ultimate strength of the substance is the point at which the substance experiences its maximum possible stress. Past this point the material will show a decrease in stress while the strain is still increasing. This phenomenon is known as necking. This final stage lasts until the point  $F$ --failure--where the material will fracture or rupture indicating the final failure.

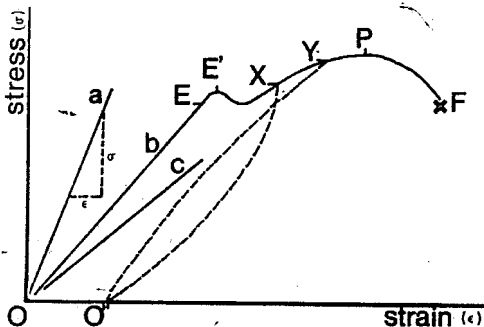


Figure A-1  
 STRESS - STRAIN CURVE

If the load is removed before the stress reaches point P (anywhere between E and P) the body is said to have a permanent deformation. For example, if the load is removed at point X and the stress has diminished to zero, the permanent deformation in the material will be of magnitude  $OO'$ . Upon reloading the material, the new level of energy sustained within the body (behavior of the substance once again becomes almost linearly elastic) will follow a path of  $O'Y$ . This behavior suggests dissipation of energy. The loop  $XO'Y$  is called a hysteresis loop.

Failure occurs in the different materials in different ways. This is mainly due to the properties of the materials and the loading conditions. For example, brittle materials such as chalk, glass, or concrete experience failures mainly in tension without exhibiting any ductility. That is, brittle materials fail without undergoing any plastic deformations or exhibiting very small plastic deformations. Whereas in ductile materials, such as mild steel or aluminum, there are large plastic deformations before the point of failure is reached. The same behavior is also true for malleable materials. While ductility is a characteristic of a material which allows large plastic deformations under tensile stresses, malleability is a characteristic which allows the same type of deformations under compressive stresses.

External loads (or external forces), as have already been mentioned, are of two main categories. Static loads are those which show steady, unchanging characteristics. However, dynamic loads, as implied by the name, are those which exhibit changing characteristics. These can be moving loads (e.g., pedestrians walking across a room or wind exerting a pressure on the building), impact loads (e.g., sudden tremors of

earthquakes), and repeated loads (e.g., vibrations or cyclic loading in machines). While the repeated loads usually cause fatigue failures because of the dissipated plastic strain energy, most materials under different loading conditions will fail due to their resilience and toughness capacity. Resilience is the capacity to absorb energy without failure in the elastic range while toughness is the capacity for the same energy in the plastic range.

Recapitulating on definitions and relations:

-Stress:  $\sigma = \frac{F}{A}$ , where F = force (or load) in kg., lb., etc., A = area in  $\text{cm}^2$ ,  $\text{in}^2$ , etc.;

-Strain:  $\epsilon = \frac{\Delta d}{d}$ , where  $\Delta d$  = incremental change in length in cm., in., etc., d = original length, in cm., in., etc.;

-Modulus of Elasticity:  $E = \frac{\sigma}{\epsilon}$ , expressed in  $\text{kg./cm.}^2$ ,  $\text{lb./in.}^2$ , etc.

## APPENDIX B

## ENVIRONMENTAL FLEXIBILITY IN SQUATTER HOUSING

More than a century ago Engels drew attention to a contradiction that lies in the very nature of the contrast between urban and rural areas.<sup>1</sup> Although this contradiction is based fundamentally on the socio-economic conditions, particularly on the modes of production and distribution of the capitalist system, (i.e. based upon the class struggle being carried out within its bounds in different spatial organizations), its ramifications on spatial organization are concrete physical embodiments of the primary contradiction that planners and designers must comprehend in their totality. Problems of squatter housing that face the rapidly urbanizing but not yet totally industrialized countries and, whose developments are principally based on market economies, present a strong case of the antithesis that exists between urban and rural ways of living.<sup>2</sup> Problems encountered by the squatters, themselves, have not

---

<sup>1</sup>F. Engels, *The Housing Question*, in K. Marx and F. Engels, *Selected Works*, 3 Vols.; Moscow: Progress Publishers, 1969 (1872), v.2, pp. 295-375.

<sup>2</sup>Squatter settlements, though not unique to any one city, are unique for cities in rapidly urbanizing countries where industrialization is impeded by market economies and still at an infant stage, where the land conditions for agriculture are not satisfactory to sustain the life of large peasant families and where the introduction of mechanization to the domain of agriculture has induced serious unemployment problems. In short, squatter settlements are the results of an ecological unbalance brought about by physical and social forces. This form of housing, stemming basically from the same reasons are referred to with different names: in Turkey—*gecekondu*; in Peru—*barriada*; in Brazil—*favela*; in Mexico—*colonia proletaria*; in Venezuela—*rancho* or *barrio*; in Chile—*poblacione*; in North Africa—*bidowilla*, etc.

only a class and group dimension to them, but also another dimension characterized by the phenomenon of urbanization--more specifically, in the transition from one mode of living to a radically different one.

Many traits of squatter settlement culture can be viewed as spontaneous attempts to meet immediate needs (in addition to more basic ones) that emerge as a result of this transition from rural existence to an urbanizing way of living. These immediate needs (e.g. shelter, security, employment, group identity and sense of belonging, the fight against alienation, means to adapt to city life, etc.) are bound to find some sort of satisfaction and gratification through the efforts of the squatters, themselves, since they are not met by the institutions and agencies of the larger urban society on behalf of the new comers to the urban area. Lewis describes four principal dimensions of the traits that characterize the culture of poverty of squatter life: the relationship between their subculture and the larger urban society (basically, a struggle of the classes); the nature of their community (level of organization beyond the nuclear and extended family); the nature of the family; and the attitudes, values and character structure of the individual.<sup>1</sup> Admittedly these can be traced and analyzed for any income group and for inhabitants of different spatial distributions and arrangements, be it the urban rich, or the slum dwellers, or the squatter settlers, or even the rural poor. However, for the squatter dwellers, in particular, two very unique dimensions need to be included in the analysis in order to have a realistic perspective: transition (urbanizing) and its expression in the spatial organization, and the

---

<sup>1</sup>O. Lewis, *The Culture of Poverty*, *Scientific American*, v.215, n.4, 1966, pp. 19-25.

actual housing process.<sup>1</sup>

The primary reason for the rural poor to be attracted to the city is the exigency to adapt to a new environment where, at least, the economic conditions are less unfavorable and more accommodating than the circumstances of the rural areas they are departing from. *Relocation* takes over *exploitation* in the adaptation process because of the unpropitious and unforgiving environmental conditions. Yet to cope with this inevitable change from accustomed way of living and familiar environmental conditions to an entirely new habitation, the squatter has to utilize all of his means and faculties, and reduce the intensity of the stress situations he encounters. The coping process in this adaptation mechanism requires different measures: the proximity of kin in the new settlement, especially in the initial stages;<sup>2</sup> building up means to restore satisfaction of the security need that has not been gratified due to the previous uncertainty and the hindering socio-economic circumstances; physical closeness to employment opportunities; steady employment; minimization of the initial cost of the dwelling; desire and strong motivation to own the dwelling, etc. During this

---

<sup>1</sup>At different levels of preoccupation these dimensions have been dealt with by various researchers. For an emphasis on the professional's (planner and architect) role and impact on the phenomenon of squatters and related planning problems see, for example: I. Tekeli, *Gecekonduhari Planlama Sorunlari ve Yollari* (Planning Problems of "Squatters"), *ODTU Gelişme Dergisi*, n.2, 1971, pp. 285-314. For an elaboration on the actual housing process of the squatters see: J.F.C. Turner, *Housing as a Verb*, in J.F.C. Turner and R. Fichter (ed.s), *Freedom to Build: Dweller Control of the Housing Process*, New York: The Macmillan Co., 1972, pp. 148-175.

<sup>2</sup>T. Yorukan, *Gecekonduhar ve Gecekondu Bolgelerinin Sosyo-Kültürel Özellikleri* (Squatter Settlements and Their Socio-Cultural Characteristics), İmar ve İskan Bak./Mesken Gen. Md., Ankara, 1968.



transition, one predominantly threatening force that is a very strong source of stress is the problem of finding steady employment.<sup>1</sup> This is not only to meet the material needs but also to climb up the hierarchical order of the need system, to satisfy social and psychological needs in order to create possibilities for a vertical social mobility imposed by the capitalistic society.

The squatter, after settling in his dwelling, is no longer the rural person he (or she) was nor is he the urban dweller--not even with the standards of small cities.<sup>2</sup> Most of the traditions and ways of life (e.g. wedding ceremonies, clothing, eating habits, recreational habits, etc.) are basically a continuation of the accustomed ones with slight changes and modifications (e.g. attitudes towards education, use of communication means, work habits, etc.) brought about by influence of the urban area. Therefore their everyday life is basically a conglomeration of both rural and the urban characteristics. One may even talk about a "squatter culture" brought into being during this transition stage.<sup>3</sup> In fact this culture is closer to *Gemeinschaft* than to *Gesellschaft* according to the typology of Toennies.<sup>4</sup> Squatters

<sup>1</sup>W. Mangin, Squatter Settlements, *Scientific American*, v.217, n.4, 1967, pp. 21-29; also, Tekeli, Gecekonduhari Planlama Sorunlari ve Yollari.

<sup>2</sup>R. Keles, *100 Soruda Türkiye'de Şehirleşme, Konut ve Gecekondu* (In 100 Questions: Urbanization, Housing and Squatter Housing in Turkey), Istanbul: Gerçek Yayınevi, 1972, pp. 194-195; N. Saran, Istanbul'da Gecekondu Problemi, (The Squatter Housing Problem in Istanbul), in E. Tumertekin, F. Mansur and P. Benedict (ed.s), *Türkiye: Coğrafi ve Sosyal Araştırmalar*, Istanbul: Caglayan Matbaası, 1971, p. 393.

<sup>3</sup>Keles, *100 Soruda...*, p. 195.

<sup>4</sup>F. Toennies, *Community and Association*, London: Routledge & Kegan Paul, 1955.

cannot reject the old ways of life nor can they very easily accept and adapt to the new way of life. To have a clear conception of the new way of life takes a long period of transformation—in most cases, several generations depending upon their rate of vertical social mobility, which is rather slow.

The dual (rural and urban) traits inherent in the everyday life of the squatters are strong evidences of the dialectical nature of human development. The dialectics of this development in the transition stage very clearly reflect themselves in the spatial organization of their living conditions—both at the community level and at the housing level. Squatter settlements, as rural/urban communities and dwellings themselves reflecting the rural/urban characteristics are physical embodiments of the transition. Spontaneity to changing needs and their physical ramifications are means of the coping process. While the entrenched habits, morals, beliefs and values are in a gradual transformation, the physical expression of this phenomenon, based on the newly emerging needs and changing environmental demands clearly illustrates itself in their dwellings as well.

One of the measures taken to reinforce the coping faculties is the flexibility provided in the actual housing process. Due to very limited family finances, the initial stage of the squatter-housing process starts with a minimum investment—generally enough to respond to the most basic demands. The need for shelter and for minimal privacy is responded to with one flimsy room. The possibility for future expansion, change, and adaptation is generally provided for from the very beginning. Again, due to limited financial reasons all of the

material resources available within the budget of the new migrant family are utilized with utmost care. Anything from straw mats or flattened tin cans to materials salvaged from construction sites (e.g. corrugated metal sheets) or cinder blocks or bricks are utilized at the initial stage of the housing process. The construction process is carried out either by the family (most of the time with the help of relatives and friends) or by "professional squatters" or a combination of the two. In any case construction does not come to a termination. The continuation of this actual construction process is one of the biggest assets of squatter dwellings, providing the maximum flexibility for the newly emerging needs and the changing priorities as the adaptation to the new environment goes on.

It is true that the sequential development of the construction process is basically due to the economic conditions of the family. It is also true that this sequential development takes place *de facto* rather than *de jure*. However, it is also true, and equally important to realize, that most of the environmental needs in the housing process emerging from a new set of conditions and requirements as the process of adaptation progresses are not determined in an *a priori* fashion. Therefore, the house itself becomes a true response to the developing needs and to the material resources, be it the construction materials to be used, or the time the owner can spare for the construction, or the money available to make changes or additions, etc. The "meso-environment" acquires the characteristics of the spontaneity that is true of the squatters themselves in meeting their other needs as well as their housing needs. This spontaneity is a phenomenon stemming from

the awakening of consciousness against the immediate source of misery and poverty rather than resulting from a submissiveness to poverty, and the lack of opportunities and rights. From the very initial act of squatter housing (trespassing out of true material need) to the actual housing process (developing in accordance with the triad of need-value-meaning emerging with the new socio-economic and environmental conditions) the totality of the squatter housing action is an example of the least alienated behavior in the man-environment relationship of the urban sphere. Operating in economies of scarcity, a wide range of individual household needs finds gratification through the action of the people themselves who make the decisions. "In order to make the best use of scarce housing resources, most of which are in any case possessed by the people themselves," Turner observes, "each household must have an adequate choice of alternative locations, of alternative forms of tenure and, of course, of alternative structures and ways of building and using them."<sup>1</sup>

When compared with and evaluated against the middle-class standards, there emerges, in the squatter dwelling, poor physical conditions (structural deficiencies; inadequate enclosing, etc.), lack of proper residential amenities (unsanitary and unhygienic conditions--toilets, running water and facilities for cleanliness; density and crowding; food storage and refrigeration; lack of utilities such as gas and electricity, etc.), and substandard community facilities (roads; schools; playgrounds, etc.). However, when evaluated in a broader ecological perspective--within the context of the past and present socio-economic

---

<sup>1</sup>Turner, *Housing as a Verb*, p. 174.

conditions and their relation to the physical environmental conditions-- squatter housing shows a considerable amount of *environmental adequacy* as well as some improvement and some decline in the physical conditions compared with the rural areas.

*Environmental adequacy*--provision for the constantly changing experiential relations--is one of the prime characteristics of squatter housing that emphasizes the human needs (material or otherwise, depending on the stage of the process) in the design elements leading towards an objectification of the total design process. This is established by means of the environmental flexibility inherent in the actual process of squatter housing. In spite of the *relative* poor living conditions, by middle-class standards, *environmental adequacy* increases the coping faculties of the migrants and concomitantly aids them in reducing the stressful situations which otherwise could lead to unsuccessful coping and thereby to strain. *Environmental adequacy*, a characteristic of the squatter housing process is a function of the *environmental flexibility* which becomes an absolute necessity for the adaptation processes required within the transition from one mode of spatial organization to another. Modifying the effective intensity of environmental demands (physical, social and psychological), *environmental flexibility* offers the inhabitant the choice of action, variations, modifications, and more responsiveness to change, and to manipulation of the physical housing environment to accommodate the squatter's constantly changing needs and concomitantly the changing spatial requirements. All this accommodation is achieved through the control and manipulability of structural elements (e.g. enclosing walls, partitions, windows, doors, furniture, etc.) and the alteration

of the spatial organization (at the dwelling scale) which are all the major constructs of *environmental flexibility*.

Observations and studies show clearly, for the Turkish situation at least, that physical conditions (structural soundness) of squatter dwellings are inferior to those of other urban dwellings and of rural dwellings.<sup>1</sup> However, squatter settlements have attracted the attention of the municipalities in bringing running water and electricity to the dwelling and therefore outnumber the rural dwellings in terms of public services extended to residential areas.<sup>2</sup> On the other hand, the population per house is more crowded in squatter dwellings than they are in rural dwellings.<sup>3</sup> According to these brief comparisons and

<sup>1</sup>Structural soundness of rural dwellings and squatter dwellings:

	<u>Rural</u>	<u>Urban</u>	<u>Squatter</u>
Structurally Sound	55.8%	41.0%	30.0%
Repairable	27.4%	33.0%	40.0%
Structurally Unsound	16.8%	26.0%	30.0%

Keles, *100 Soruda...*, p. 181.

<sup>2</sup>Services accessible to rural dwellings and squatter dwellings:

	<u>Rural</u>	<u>Squatter</u>
No running water	97.7%	71.2%
No electricity	97.6%	41.1%

Keles, *100 Soruda...*, p. 182.

<sup>3</sup>Habitable rooms per house:

Rural dwellings: 2.2

Squatter dwellings: 1.6

(While 58.4% of the rural population lives in houses with 1 or 2 habitable rooms, this is slightly higher in squatter settlements—72%).

Population per room:

Rural Areas: 2.1

Squatter Settlements: 2.6

Keles, *100 Soruda...*, p. 181; the population per room in some squatter settlements is as high as 2.99. *Gulveren Gecekondu Arastirmasi* (Gulveren Squatter Settlement Survey), *Imar ve Iskan Bak./Meskan Gen. Md., Arastirma Dairesi, Gecekondu On Calismalari 2*, Ankara, 1965, pp. 31-32. When compared with the standards of some industrialized Western countries, crowding in squatter settlements is at a "pathological"

statistical information on the dwelling itself, one may tend to think dissatisfaction and discontent with the housing environment is a common complaint. Some studies have indicated that space complaints as dissatisfaction with housing is partially a result of not being able to accommodate the changing family needs or of changes in the quality of the dwelling itself or of its environment.<sup>1</sup> Although there is some uniformity between the level of satisfaction and physical (objective) characteristics of the dwelling, there is not a very strong correlation just because satisfaction is partly a subjective phenomenon rather than purely objective. In the case of the squatter housing, the situation is even more complicated.

Definitely, there is some rise in the income level of the squatters, no matter how small it may be.<sup>2</sup> Especially when compared with the potentials of national production and when the level of injustice in the distribution of the income is taken in consideration, rise in the income level (relative to the previous income level) does not amount to a considerable amount.<sup>3</sup> Yet when asked if they want to return to their

---

level: France considers 1 person/habitable room as normal, 2 persons/habitable room as critical, and 2.5 persons/habitable room as pathological; U.S.A. considers more than 1.5 persons/habitable room critical; Great Britain recommends 1.1 persons/habitable room in the greater London area.

<sup>1</sup>N.N. Foote, et al., *Housing Choices and Housing Constraints*, New York: McGraw-Hill Book Co., 1960, p. 156.

<sup>2</sup>This is a fact observed by many researchers. See, for example: I. Yasa, *Ankara'da Gecekondu Aileleri* (Squatter Families in Ankara), Sağlık ve Sosyal Yardım Bak. Sosyal Hiz. Gen. Md. Yayinlari, n.46, Ankara: Akin Matbaasi, 1966, pp. 120-141; C.W.M. Hart, *Zeytinburnu Gecekondu Bolgesi* (Zeytinburnu Squatter Settlement), Istanbul: Ist. Tic. Odasi Yayinlari, 1969; also, Saran, *Istanbul'da Gecekondu Problemi*, p. 403.

<sup>3</sup>Keles, *100 Scruda...*, p. 192.

villages most squatters answer in a definite "no", giving reasons such as "I have nothing in the village," or "I am earning my living here," or "it is better here, than in the village." This is in spite of the fact that there are additional expenses in the urban areas, more crowded living conditions in the squatter settlements, and lower quality dwellings. Although overall socio-economic conditions are the prime reasons for the squatters to choose city life, *environmental adequacy*, inherent in the housing process, is not a negligible factor in their motivations and decisions to cope with the stressful situations. It is at least a compensating factor enabling the residents to reduce those stresses arising from environmental demands. The criticalness of this environmental characteristic in everyday life lies in its influence and effectiveness on one's daily activity and in the coping processes one experiences with environmental stresses. Explicit design implications of *environmental flexibility* substantiate the contrast between the phenomenon of alienation and *environmental adequacy*. Alienation with respect to environmental overcontrol or undercontrol is alleviated with the *environmental flexibility*, which stipulates the individual's need for comprehension and control of the environment.

Social security, group identity and sense of belonging have been mentioned earlier as important needs to be satisfied in the transition stage. Also important is the ability to perform some of the accustomed habits of daily life with respect to housing environments. For instance, peasants in Turkey (generally true for most rural societies) spend considerable time outdoors during the day. Most of the daily chores are executed outside the house or on the roof. Social contact with



neighbors during these outdoor activities and mutual help in general is one of the strong characteristics of living in rural areas. Although studies indicate that there is a drop in these rural characteristics (especially in mutual help) attitudes and behavior of squatters are closer to their previous mode of living than they are to the urban way of living.<sup>1</sup> This trend is also observed in the daily use of outdoor spaces. As small as it may be the land adjacent to the house or even the public areas, such as the street in front of the house, are used part of the day for daily chores, or social contact, or just leisurely sitting. Therefore any housing environment that will accommodate the needs of the squatters, especially in the transition stage, must lend itself to such interchangeable use of indoor and outdoor spaces. A strong evidence of this fact is the failure experienced in a government-subsidized public housing unit in Ankara.<sup>2</sup> Apartment houses that were built basically for the squatter dwellers stayed vacant for a long time and finally were leased to lower-middle-income civil servants. The unfamiliar layouts of the three or four story apartment houses, in spite of their superiority of physical conditions, proper residential amenities and community facilities, as well as the fear of the loss of group identity, and the threat to social security, are no doubt, the primary reasons for the unattractiveness of these block-apartments. Also, an important factor in this problem is the lack of *environmental flexibility*, which this new government

---

<sup>1</sup>Yasa, *Ankara'da Geçekonda Aileleri*, pp. 205-209.

<sup>2</sup>To avoid any misunderstanding, it must be said that this is an argument not against government assistance, but against the shallow treatment of a complex problem. Furthermore, as long as it is not dominated by market economies and a reductionist attitude, it is our belief that government subsidized public housing can be far better than privately financed mass housing.

housing failed to provide. In spite of their quantitative and objective superiority, the architect designed housing did not have the quality which is the outgrowth of *environmental flexibility* found in the squatter dwellings where people can manipulate, change and control their own environment, according to their need and to their priorities.

There is also another conflict that must not be overlooked at this point. It is the contradiction that exists between the attributed meaning of the designer and the intended meaning of the inhabitant of a dwelling. This contradiction becomes clearly visible, when viewed in the light of the above example. While the planners and designer operated on their own biased perception, further supported by their middle-class values and their intellectual inclination, the dwellings were not suited to the needs of the people for whom they were designing. The intended meaning was not congruent with how the people, who eventually were to use that space, interpreted the meaning attached to it. What the future inhabitants attribute as a meaning within their own needs and values is almost diametrically opposed to those of the designers. Not only is the hierarchy of priorities in conflict but also the nature of household activities is interpreted in a simplified and mechanistic way contrary to what it actually is. The dialectical nature of these activities and of the decisions made with respect to the housing environment is truly reflected in the very nature of the housing process that takes place in the squatter settlements. This is not to say that the inhabitants of squatter settlements are totally free of stressful situations. They are in stress situations almost constantly due to one force or another. But their ability to control and manipulate their own environment, and to give their own meaning

rather than attribute someone else's to the space they live in, reduces the chronic frustration that may be induced otherwise.

A very similar case, though different in context, was experienced in the Soviet Union right after the revolution. At first, it was assumed that by forcing people to live collectively in particular buildings, transformation from one mode of living to a radically different one, and transformation of human nature could be achieved. After the failure of the first attempts where the goal was defined to create "the structures needed to transform the nation's way of life,"<sup>1</sup> utopian ideals were abandoned in favor of a more gradual transition to communal utilization. Architecture was accepted not as an entity to compel the inhabitants to live in a predetermined and idealized form but merely as a supporting system that is part of the larger social system.

These examples can help us to understand the critical importance of flexibility in housing environment. The phenomenon being experienced in the case of squatter dwellings or in the Soviet Union in the early twenties clearly illustrates the dialectics of human development and ecological relations. The dialectical nature of the man-environment relationship is not only true for the transformation of morals and social values but, also, for the entrenched environmental habits and values, particularly in regard to the housing environments. Therefore, the housing process rather than the dwelling as a product must be viewed in a dialectical manner instead of a mechanistic way with simplified

---

<sup>1</sup>A. Kopp, *Town and Revolution: Soviet Architecture and City Planning 1917-1935*, trans. T.E. Burton, London: Thames and Hudson, 1970, p. 101; for a more elaborate description of post-revolution housing see, also pp. 67-159.

cause-and-effect relationship or as an idealized situation. Within this dialectical nature of an ecological relationship, particularly in the housing process, *environmental flexibility* emerges as a very strong tool to be utilized throughout this process.

## SELECTED BIBLIOGRAPHY

- ABRAMS, C. *Man's Struggle for Shelter in an Urbanizing World*. Cambridge, Mass.: MIT Press, 1966.
- ACAROGLU, I. "Gecekondulu Alanlari Yer Secimi Kriterleri ve Onleme Yaklasimlari" (Criteria for the Selection of Locations for Squatter Housing), Project Report, YAE. PR. 22, Middle East Technical University, Ankara, June 1972. (Mimeographed.)
- ACKERMAN, J. "Indoor Climate, Seminar on Human Biometeorology." U.S. Dept. of Health, Education, and Welfare, Public Health Serv. Publ. 999-AP-25, Wash., D.C., 1967, pp. 133-144.
- ALEXANDER, C. *Notes on the Synthesis of Form*. Cambridge, Mass.: Harvard University Press, 1964.
- ALEXANDER, C. The City as a Mechanism of Sustaining Human Contact. *Environment for Man: The Next Fifty Years*. Edited by W.R. Ewald, Jr. Bloomington, Ind.: Indiana University Press, 1967, pp. 60-109.
- ALEXANDER, C., ISHIKAWA, S., and SILVERSTEIN, M. *A Pattern Language Which Generates Multi-Service Centers*. Berkeley, Calif.: Center for Environmental Structure, 1968.
- ALEXANDER, C. et al. *Houses Generated by Patterns*. Berkeley, Calif.: Center for Environmental Structure, 1970.
- ALEXANDER, C. and POYNER, B. The Atoms of Environmental Structure. *Emerging Methods in Environmental Design and Planning*. Edited by G.T. Moore. Cambridge, Mass.: MIT Press, 1970, pp. 308-321.
- ALEXANDER, F. *Psychosomatic Medicine, Its Principles and Application*. New York: Norton, 1950.
- APPLEY, M.H. and TRUMBULL, R. eds. *Psychological Stress: Issues in Research*. New York: Appleton-Century-Crofts, 1967.
- ARENDT, H. *The Human Condition*. Chicago: University of Chicago Press, 1958.
- ARNHEIM, R. *Art and Visual Perception*. Berkeley: University of California Press, 1971.
- ARONIN, J. *Climate and Architecture*. New York: Reinhold, 1943.

- ATHERLEY, C.G. Noise as a Stress Phenomenon. *Proceedings of the Symposium on the Psychological Effects of Noise*. Edited by W. Taylor. Cardiff, September 1967.
- AVINERI, S. *The Social and Political Thought of Karl Marx*. Cambridge, England: Cambridge University Press, 1968.
- BANHAM, R. *Theory and Design in the First Machine Age*. New York: Praeger Publishers, 1960.
- BARAKAT, H. Alienation: A Process of Encounter between Utopia and Reality. *The British Journal of Sociology*, v.20, n.1, 1969, pp. 1-10.
- BARKER, R.G. *Ecological Psychology*. Stanford: Stanford University Press, 1968.
- BASOWITZ, H. et al. *Anxiety and Stress: An Interdisciplinary Study of a Life Situation*. New York: McGraw-Hill Book Co., 1955.
- BERLYNE, D.E. Novelty and Curiosity as Determinants of Exploratory Behavior. *British Journ. Psychol.*, v.41, 1950, pp. 68-80.
- BERNSTEIN, R.J. *Praxis and Action*. Philadelphia: University of Pennsylvania Press, 1971.
- BLACKWELL, H.R. and BLACKWELL, O.M. The Effect of Illumination Quantity upon the Performance of Different Visual Tasks. *Illum. Engng.*, v.63, n.4, 1968, pp. 143-150.
- BOUDON, P. *Lived-in Architecture: Le Corbusier's Pessac Revisited*. Translated by G. Onn. Cambridge, Mass.: MIT Press, 1972 (1969).
- BRANCH, M.C., et al. *Outdoor Noise and the Metropolitan Environment: Case Study of Los Angeles with Special Reference to Aircraft*. Los Angeles: Department of City Planning, 1970.
- BREW, J.O. Archaeology of Alkali Ridge, Southeastern Utah. *Papers of the Peabody Museum of American Archaeology and Ethnology*, Harvard University, v.21, 1946.
- BROADBENT, D.E. *Perception and Communication*. New York: Pergamon Press, 1958.
- BROADBENT, D.E. Effect of Noise on an 'Intellectual' Task. *Journ. Acoust. Soc. Am.*, v.30, n.9, 1958, pp. 824-827.
- BROADBENT, G. and WARD, A. eds *Design Methods in Architecture*. (Architectural Association Paper No. 4). New York: George Wittenborn, 1969.
- BROADY, M. Social Theory in Architectural Design. *Arena*, January 1966, pp. 149-154.

- EROLIN, B.C. and ZEISEL, J. Mass Housing: Social Research and Design. *Architectural Forum*, July-August 1968, pp. 66-70.
- CALHOUN, J.B. Population Density and Social Pathology. *Scientific American*, v.206, n.2, 1962, pp. 139-148.
- CALHOUN, J.B. Design for Mammalian Living. *Architectural Association Quarterly*, v.1, n.3, 1969, pp. 24-35.
- CALQUHOUN, A. Typology and Design Method. *Arenx*, June 1967, pp. 11-14.
- CARSON, D.H. and DRIVER, B.L. An Ecological Approach to Environmental Stress. *The Am. Beh'l Scientist*, Sept. 1966, pp. 8-11.
- CARSON, D.H. and DRIVER, B.L. *An Environmental Approach to Human Stress and Well Being: With Implications for Planning*. Preprint 194, Mental Health Res. Inst., University of Michigan, Ann Arbor, June 1970.
- CHAPIN, F.S. and HIGHTOWER, H.C. "Household Activity Systems--A Pilot Study," Center for Urban and Regional Studies, Inst. for Res., in Soc. Science, UNC, Chapel Hill, May 1966.
- COLLINS, J.B. and PRUEN, B. Perception Time and Visual Fatigue. *Ergonomics*, v.5, n.4, 1962, pp. 533-538.
- COLLINS, P. *Changing Ideals in Modern Architecture*. London: Faber and Faber, 1965.
- COOPER, C. *Resident Attitudes Towards the Environment at St. Francis Square, San Francisco; A Summary of Initial Findings*. Working Paper No. 126, Institute of Urban and Regional Development, The University of California, Berkeley, July 1970.
- COOPER, C. *The House As a Symbol of Self*. Working Paper No. 120, Institute of Urban and Regional Development, The University of California, Berkeley, May 1971.
- DEAN, J.P. Housing Design and Family Values. *Urban Housing*. Edited by W.L.C. Wheaton, G. Milgram, and M.E. Meyerson. New York: The Free Press, 1966, pp. 127-138.
- DETWYLER, T.R. ed. *Man's Impact on Environment*. New York: McGraw-Hill Book Co., 1971.
- DOHRENWEND, B.P. The Social Psychological Nature of Stress. *Journ. Abnormal and Soc. Psychol.*, v.62, n.2, 1961, pp. 203-230.
- DRURY, M.J.: *Mobile Homes: The Unrecognised Revolution in American Housing*. New York: Praeger Publishers, 1972.
- D'SOUZA, V.S. *Social Structure of a Planned City-Chandigarh*. New Delhi: Orient Longmans Ltd., 1968.

- DUBOS, R. *Man Adapting*. New Haven: Yale University Press, 1965.
- DYMSHITS, A. *Realism and Modernism. Problems of Modern Aesthetics*. Edited by S. Mozhnyagin. Moscow: Progress Publishers, 1969, pp. 261-298.
- EDHOLM, O.G. *Problems of Acclimatization in Man. Weather*, v.21, 1966, pp. 340-350.
- EMERY, P.A. *Creative Aspects of Shanty Towns. Ekistics*, v.15, n.90, pp. 268-271.
- ENGELS, F. *The Housing Question. K. Marx and F. Engels, Selected Works*. 3 Vols.; Moscow: Progress Publishers, 1969 (1872), v.2, pp. 295-375.
- ESSER, A.H. *Ethological Contributions to Understanding the Human Use of Space. Man-Environment Systems*, v.2, n.2, 1972, pp. 105-108.
- EULER, R.C. *Southern Paiute Archeology. American Antiquity*, v.29, n.3, 1964, pp. 379-381.
- PIREY, W. *Sentiment and Symbolism as Ecological Variables. Am. Soc. Rev.*, v.10, n.2, 1945, pp. 140-148.
- FITCH, J.M. *Architecture and the Esthetics of Plenty*. New York: Columbia University Press, 1961.
- FITCH, J.M. *American Building: The Environmental Forces that Shaped It*. 2d Ed. rev.; Boston: Houghton Mifflin Co., 1972.
- FLYNN, J.E. and SEGIL, A.W. *Architectural Interior Systems*. New York: Van Nostrand Reinhold Co., 1970.
- FOOTE, N.N. *et al. Housing Choices and Housing Constraint*. New York: McGraw-Hill Book Co., 1960.
- FORDE, D. *Habitat, Economy and Society*. New York: E.P. Dutton Co., Inc., 1963 (1949).
- FREUD, S. *New Introductory Lectures on Psychoanalysis*. Translated by J. Strachey. New York: W. W. Norton & Co., 1965 (1933).
- FREUD, S. *Civilization and Its Discontents*. Translated by J.S. Strachey. New York: W.W. Norton & Co., 1962 (1930).
- FRIED, M. and GLEICHER, P. *Some Sources of Residential Satisfaction in an Urban Slum. AIP Journ.*, v.27, n.4, 1961, pp. 305-315.
- FRIEDMAN, S.M. "Relationship Between Cognitive Complexity, Interpersonal Dimensions, and Spatial Preferences and Propensities." Unpublished Ph.D. dissertation, University of California, Berkeley, 1969.



- GANS, H. *People and Plans: Essays on Urban Problems and Solutions*. New York: Basic Books, 1968.
- GANS, H. *The Urban Villagers*. New York: The Free Press, 1962.
- GIVONI, B. *Man, Climate, Architecture*. New York: Elsevier, 1969.
- GLASS, D.C. and SINGER, J. *Urban Stress: Experiments on Noise and Social Stressors*. New York: Academic Press, 1972.
- GLEZERMAN, G. and KURSANOV, G. eds *Historical Materialism: Basic Problems*. Translated by D. Fidlop. Moscow: Progress Publishers, 1968.
- GOODMAN, R. *After the Planners*. New York: Simon & Schuster, 1971.
- GOROMOSOV, M.S. *The Physiological Basis of Health Standards for Dwellings*. Geneva: World Health Organization; Public Health Papers No. 33, 1968.
- GOTTMAN, J. The Ethics of Living at High Densities. *Ekistics*, v.21, n.123, 1966, pp. 141-145.
- GREENBLE, B.B. An Ethological Approach to Community Design. *Environmental Design Research* (Selected Papers, 4th International EDRA Conference). Edited by W.F.E. Preiser. 2 Vols.; Stroudsburg, Penn.: Dowden, Hutchinsonson & Ross, Inc., 1973.
- GRIEVE, J.I. Thermal Stress in a Single Storey Factory. *Ergonomics*, v.3, n.4, 1960, pp. 297-306.
- HABRAKEN, N.J. *The Supports and the People: The End of Housing Project*. Amsterdam: Scheltema & Holkema, 1961.
- HACK, J.T. The Changing Physical Environment of the Hopi Indians of Arizona. *Papers of the Peabody Museum of American Archaeology and Ethnology*, Harvard University, v.35, n.1, 1942.
- HALL, E.T. *The Hidden Dimension*. Garden City, N.Y.: Doubleday/Anchor, 1969 (1966).
- HALLSWELL, A.I. The Protocultural Foundations of Human Adaptation. *Man in Adaptation: The Biosocial Background*. Edited by Y.A. Cohen. Chicago: Aldine Publishing Co., 1968, pp. 62-75.
- HARRIS, F.E. and BILLS, R.E. Psychological Consideration of Color Selection. *The American School and Univ.*, v.25, 1953-1954, pp. 157-160.
- HARTMAN, C.W. The Limitations of Public Housing - Relocation Choices in a Working-Class Community. *AIP Journ.*, v.29, n.4, 1964, pp. 283-296.

- HARTMAN, H. Comments on the Psychoanalytic Theory of the Ego. *The Psychoanalytic Study of the Child*, Vol. 5; New York: International Universities Press, 1950, pp. 74-96.
- HAWEL, W. Personality, Situation, Activity, and Sound as Parameter of the Evaluation of Noise. *Proceedings of the Symposium on the Physical Effects of Noise*. Edited by W. Taylor. Cardiff, September 1967.
- HAWLEY, A. *Human Ecology: A Theory of Community Structure*. New York: Ronald Press, 1950.
- HERON, W. The Pathology of Boredom. *Scientific American*, v.196, n.1, 1957, pp. 52-56.
- HERSHBERGER, R.G. "A Study of Meaning and Architecture." Unpublished Ph.D. dissertation, University of Pennsylvania, 1969.
- HESSELGREN, S. *The Language of Architecture*. Lund, Sweden: Studentlitteratur, 1969.
- HEWETT, E.L., HENDERSON, J., and ROBBINS, W.W. The Physiography of the Rio Grande Valley. *Bulletin 54, Bureau of American Ethnology*. Washington, 1913.
- HEWITT, H., BRIDGERS, D.J., and SIMONS, R.H. Lighting and Environment: Some Studies in Appraisal and Design. *Trans. Illum. Eng. Soc.*, v.30, n.4, 1965, pp. 91-110.
- HOLE, V. Social Effects of Planned Rehousing. *The Town Planning Review*, v.30, July 1959, pp. 161-173.
- HOLLING, C.S. and GOLDBERG, M.A. Ecology and Planning. *AIP Journ.*, v.37, n.4, 1971, pp. 221-230.
- HOPKINSON, R.G. and LONGMORE, J. Attention and Distraction in the Lighting of Workplaces. *Ergonomics*, v.2, n.4, 1959, pp. 321-333.
- HOPKINSON, R.G. and COLLINS, J.B. *The Ergonomics of Lighting*. London: Macdonald & Co., 1970.
- HORVATH, F.E. Psychological Stress: A Review of Definitions and Experimental Research. *General Systems*, v.4, 1959, pp. 203-230.
- HOWARD, A. and SCOTT, R.A. A Prepared Framework for the Analysis of Stress in the Human Organism. *Behavioral Science*, v.10, n.2, 1965, pp. 141-160.
- HUNTINGTON, E. *Civilization and Climate*. 3rd Ed.; New Haven: Yale University Press, 1924.
- HUTCHEON, R.J. et al. Observations of the Urban Heat Island in a Small City. *Bull., Am. Meteorological Soc.*, v.48, n.1, 1967, pp. 7-9.

- JANIS, I.L. Problems of Theory in the Analysis of Stress Behavior. *The Journal of Social Issues*, v.10, n.3, 1954, pp. 12-25.
- JANIS, I.L. *Stress and Frustration*. New York: Harcourt Brace Jovanovich, Inc., 1969.
- JENCKS, C. and BAIRD, G. eds *Meaning in Architecture*. New York: George Braziller, 1970.
- JERISON, H.J.: Effects of Noise on Human Performance. *Journ. Applied Psychol.*, v.43, n.2, 1959, pp. 96-101.
- KARAGODINA, I.L. Characteristics of Noise Levels Inside Apartments of Dwelling Houses in Moscow. *Gigiena i Sanitarita*, v.24, n.12, 1959, pp. 7-11.
- KARDINER, A. and SPIEGEL, H. *War Stress and Neurotic Illness*. New York: Hoeber, 1947.
- KELES, R. *100 Soruda Turkiye'de Sehirlenme, Konut ve Gecekondul (In 100 Questions: Urbanization, Housing and Squatter Housing in Turkey)*. Istanbul: Gercek Yayınevi, 1972.
- KEPES, G. *Language of Vision*. Chicago: Paul Theobald Co., 1944.
- KHAZANOV, D. Standard Architecture or Architectural Standard. *Arkhitektura SSSR*, n.9, September 1970, pp. 30-33.
- KIDDER, A.V. *An Introduction to the Study of Southwestern Archeology*. New Haven: Yale University Press, 1924.
- KNOWLES, R. *Owens Valley Study: A Natural Ecological Framework For Settlement*. Los Angeles: University of Southern California, 1969.
- KOHLER, W. *Gestalt Psychology*. New York: The New American Library, Inc., 1947.
- KOFFKA, K. *Principles of Gestalt Psychology*. New York: Harcourt, Brace & World Inc., 1935.
- KOLAKOWSKI, L. *Toward a Marxist Humanism*. Translated by J.Z. Peel. New York: Grove Press, 1968.
- KOPP, A. *Town and Revolution: Soviet Architecture and City Planning 1917-1935*. Translated by T.E. Burton. London: Thames & Hudson, 1970 (1967).
- KRYTER, K.D. *The Effects of Noise on Man*. New York: Academic Press, 1970.
- KUEHNER, R.L. Bacteria and Odor Control Problem in Occupied Spaces. *Heating, Piping & Air Conditioning*, v.24, n.12, 1952, pp. 113-119.

- KUGER, L. Neighbor on the Hearth. *Environmental Psychology*. Edited by H.M. Proshansky, W.H. Ittelson, and L.G. Rivlin. New York: Holt, Rinehart & Winston, 1970, pp. 246-255.
- LAL, R. *Living Conditions in Multi-Storeyed Habitations and Their Socio-Psychological Impacts*. Roorkee, India: New Chand & Sons, 1969.
- LANSING, J.B., MARANS, R.W., and ZEHNER, R.B. *Planned Residential Environments*. Ann Arbor, Mich.: Survey Res. Center, Inst. for Social Res., University of Michigan, 1970.
- LAZARUS, R.S. *Psychological Stress and Coping Process*. New York: McGraw Hill Book Co., 1966.
- LAZARUS, R.S. Cognitive and Personality Factors Underlying Threat and Coping. *Social Stress*. Edited by S. Levine and N.A. Scotch. Chicago: Aldine Pub. Co., 1970, pp. 143-164.
- LE CORBUSIER. *Towards a New Architecture*. Translated by F. Etchells. New York: Praeger Publishers, 1960 (1927).
- LE CORBUSIER. *Le Corbusier et Pierre Jeanneret, Oeuvre Complete: (1910-1965)*. Edited by W. Boesiger and O. Stonorov. 7 vols.; Zurich: Les Editions d'Architecture, 1929-1965.
- LEE, D.H.K. and HENSCHER, A. "Evaluation of Thermal Environment in Shelters." U.S. Dept. of Health, Education, and Welfare, Div. Occupational Health, TR-8, Wash., D.C., 1963.
- LEITHEAD, C.S. and LIND, A.R. *Heat Stress and Heat Disorders*. Philadelphia: F.A. Davis Co., 1964.
- LEWIN, K. *A Dynamic Theory of Personality*. New York: McGraw-Hill Book Co., 1935.
- LEWIN, K. *Principles of Topological Psychology*. New York: McGraw Hill Book Co., 1936.
- LEWIS, O. *La Vida*. New York: Vintage Books, 1965.
- LEWIS, O. The Culture of Poverty. *Scientific American*, v.215, n.4, 1966, pp. 19-25.
- LIPMAN, A. The Architectural Belief System and Social Behavior. *The British Journal of Sociology*, v.20, n.2, 1969, pp. 190-204.
- LOGAN, H.L. The Relationship of Light to Health. *Illum. Engng.*, v.62, n.3, 1967, pp. 159-167.
- LOWRY, W.P. The Climate of Cities. *Scientific American*, v.217, n.2, 1967, pp. 15-23.
- LUCKIESH, M. *Light, Vision, and Seeing*. New York: Van Nostrand, 1944.

- MCCRATH, J.E. ed. *Social and Psychological Factors in Stress*. New York: Holt, Rinehart and Winston, Inc., 1970.
- MCHARG, I.L. *Design with Nature*. Garden City, New York: Doubleday/Natural History Press, 1969.
- MCMULLEN, R. *Art, Affluence and Alienation*. New York: Mentor Books, 1969.
- MALDONADO, T. *Design, Nature, and Revolution: Toward a Critical Ecology*. Translated by M. Domandi. New York: Harper & Row Publishers, 1972.
- MANDEL, E. and NOVACK, G. *The Marxist Theory of Alienation*. New York: Pathfinder Press, Inc. (A Merit Pamphlet), 1970.
- MANGIN, W. Squatter Settlements. *Scientific American*, v.217, n.4, 1967, pp. 21-29.
- MANNHEIM, K. *Ideology and Utopia*. Translated by L. Wirth and E. Shils. New York: Harcourt, Brace & World, 1936.
- MARX, K. Economic and Philosophical Manuscripts of 1844. *Karl Marx: Early Writings*. Translated and edited by T.B. Bottomore. New York: McGraw-Hill Book Co., 1963.
- MARX, K. *Writings of the Young Marx on Philosophy and Society*. Translated and edited by L.D. Easton and K.R. Guddat. Garden City, N.Y.: Doubleday/Anchor, 1967.
- MARX, K. *Capital*. Translated by S. Moore and E. Aveling. 3 vols.: New York: International Publishers, 1967.
- MARX, K. *The Grundrisse*. Translated and edited by D. McLellan. New York: Harper and Row Publishers, 1971.
- MARX, K. and ENGELS, F. Feuerbach: Opposition of the Materialistic and Idealistic Outlook. *Selected Works*. 3 vols.: Moscow: Progress Publishers, 1969, v.1, pp. 16-80.
- MASLOW, A.H. *Motivation and Personality*. New York: Harper & Row Publishers, 1954.
- MECHANIC, D. *Students Under Stress*. Glencoe, Ill.: The Free Press, 1962.
- MECHANIC, D. Some Problems in Developing a Social Psychology of Adaptation to Stress. *Social and Psychological Factors in Stress*. Edited by J.E. McGrath. New York: Holt, Rinehart and Winston, Inc., 1970, pp. 104-123.
- MEDAWAR, P.B. The Meaning of Fitness and the Future of Man. *Man in Adaptation: The Biosocial Background*. Edited by Y.A. Cohen. Chicago: Aldine Publishing Co., 1968, pp. 27-37.

- MESZAROS, I. *Marx's Theory of Alienation*. New York: Harper & Row Publishers, 1970.
- MEYER, F. Housing the Elderly. *Air Condit. Heat. Vent.*, v.59, n.3, 1962, pp. 50-54.
- MICHELSON, W. *Man and His Urban Environment: A Sociological Approach*. Reading, Mass.: Addison-Wesley Pub. Co., 1970.
- MILLER, J.G. Living Systems: Basic Concepts. *Behavioral Science*, v.10, n.3, 1965, pp. 193-237.
- MILROY, E.A. and ATKINSON, G.A. *Heating for High Density Housing: A Guide to Modern Methods in Use*. Building Research Current Papers, Design Series No. 26, 1964.
- MITTELMANN, B. Motility in Infants, Children, and Adults. *The Psychoanalytic Study of the Child*. Vol. 9; New York: International Universities Press, 1954, pp. 142-177.
- MOLLER, C.B. *Architectural Environment and Our Mental Health*. New York: Horizon Press, 1968.
- MOORE, G.T. ed. *Emerging Methods in Environmental Design and Planning*. Cambridge, Mass.: MIT Press, 1970.
- MUNN, R.E. *Bimeteorological Methods*. New York: Academic Press, 1970.
- MURRAY, H.A. *Explorations in Motivations*. New York: Oxford University Press, 1938.
- NEWMAN, O. *Defensible Space: Crime Prevention in Urban Design*. New York: The MacMillan Co., 1972.
- NORBERG-SCHULZ, C. *Intentions in Architecture*. Cambridge, Mass.: MIT Press, 1965.
- NORBERG-SCHULZ, C. *Existence, Space and Architecture*. New York: Praeger Publishers, 1971.
- OGDEN, C.K. and RICHARDS, I.A. *The Meaning of Meaning*. New York: Harcourt, Brace, 1923.
- OLGYAY, V. *Design with Climate*. Princeton, N.J.: Princeton University Press, 1963.
- OSGOOD, C.E. SUCI, G.J., and TANNENBAUM, P.H. *Measurement of Meaning*. Urbana, Ill.: University of Illinois Press, 1957.
- PAGE, J.K. The Role of Lighting in the Search for Better Interiors - Some Problems. *Trans. Illum. Eng. Soc.*, v.27, n.4, 1962, pp. 153-163.
- PAGE, J.K. Human Thermal Comfort. *Architects' Journ.*, v.137, n.25, 1963, pp. 1301-1308.

- PARASKEVOPOULOS, S.C.A., et al. *Structural Potential of Foam Plastics for Housing in Underdeveloped Areas*. Ann Arbor, Mich.: Architectural Res. Lab., University of Michigan, 1966.
- PARK, R.E., BURGESS, E.W. and MCKENZIE, R.D. *The City*. Chicago: The University of Chicago Press, 1925.
- PERIN, C. *With Man In Mind*. Cambridge, Mass.: MIT Press, 1970.
- PIAGET, J. and INHELDER, B. *The Child's Conception of Space*. Translated by F.J. Langdon and J.L. Lunzer. New York: W.W. Norton & Co., 1967 (1948).
- PLANT, J. Some Psychiatric Aspects of Crowded Living Conditions. *Am. Journ. of Psychiatry*, v.9, n.5, 1930, pp. 849-860.
- PREISER, W.F.E. ed., *Environmental Design Research* (Proceedings of the 4th International EDRA Conference). 2 Vols.; Stroudsburg, Penn.: Dowden, Hutchinson & Ross, Inc., 1973.
- PROSHANSKY, H.M., ITTELSON, W.H. and RIVLIN, L.G. eds *Environmental Psychology*. New York: Holt, Rinehart & Winston, 1970.
- PROSHANSKY, H.M. Environmental Psychology and the Design Professions. *Architecture For Human Behavior: Collected Papers from a Mini-Conference*, Philadelphia Chapter, AIA, November 1971, pp. 15-22.
- PYRON, B. Form and Diversity in Human Habitats: Judgmental and Attitude Responses. *Environmental Behavior*, v.4, n.1, 1972, pp. 87-120.
- RAND, G. Children's Images of Houses: A Prolegomena to the Study of Why People Still Want Pitched Roofs. *Proceedings of the EDRA 3/AR 8 Conference*. Edited by W.J. Mitchell. Los Angeles: University of California Press, 1972.
- RAPOPORT, A. Some Consumer Comments on a Designed Environment. *Arena*, January 1967, pp. 176-178.
- RAPOPORT, A. *House Form and Culture*. Englewood Cliffs, N.J.: Prentice-Hall, 1969.
- RAPOPORT, A. and HAWKES, R. The Perception of Urban Complexity. *AIP Journ.*, v. 36, n.2, 1970, pp. 106-111.
- RAPOPORT, A. and KANTOR, R.E. Complexity and Ambiguity in Environmental Design. *AIP Journ.*, v.33, n.4, 1967, pp. 210-221.
- RAPPAPORT, R.A. Nature, Culture, and Ecological Anthropology. *Man Culture, and Society*. Edited by H.L. Shapiro. London: Oxford University Press, 1971, pp. 237-267.
- REYNOLDS, I. and NICHOLSON, C. Living Off the Ground. *Architects' Journ.*, v.150, 1969, pp. 459-470.

- ROSON, I. The Social Effects of the Physical Environment. *AIP Journ.*, v.27, n.2, 1961, pp. 127-133.
- SANDERS, A.F. The Influence of Noise on Two Discrimination Tasks. *Ergonomics*, v.4, n.3, 1961, pp. 253-258.
- SCHORR, A.L. *Slums and Social Insecurity*. Washington, D.C.: U.S. Government Printing Office, 1966.
- SCOTT, J. Testing a Housing Design Reference: A Pilot Study. *Architectural Association Quarterly*, v.2, n.1, 1970, pp. 23-31.
- SCOTT, R. and HOWARD, A. Models of Stress. *Social Stress*. Edited by S. Levine and N.A. Scotch. Chicago: Aldine Pub. Co., 1970, pp.259-278.
- SCOTT, T.H., et al., Cognitive Effects of Perceptual Isolation. *Canad. Journ. Psychol.*, v.13, 1959, pp. 200-209.
- SEARLES, H.T. *The Nonhuman Environment: In Normal Development and In Schizophrenia*. New York: International Universities Press, 1960.
- SELYE, H. *The Stress of Life*. New York: McGraw-Hill Book Co., 1956.
- SEVERINO, R. *Equipotential Space - Freedom in Architecture*. New York: Praeger Publishers, 1970.
- SHERIF, M. *The Psychology of Social Norms*. New York: Harper & Row Publishers, 1936.
- SIMONSON, E. and BROZEK, J. Effects of Illumination Level on Visual Performance and Fatigue. *Journ. Opt. Soc. Amer.*, v.38, n.4, 1948, pp. 384-397.
- SOMMER, R. *Personal Space*. Englewood Cliffs, N.J.: Prentice-Hall, 1969.
- SPENCER, J., et al. *Stress and Release in an Urban Estate*. London: Tavistock Publications, 1964.
- STEVENSON, A., MARTIN, E., and O'NEILL, J. *High Living: A Study of Family Life Living in Flats*. Carlton, Victoria: Melbourne University Press, 1967.
- STUDER, R.G. The Dynamics of Behaviour - Contingent Physical Systems. *Design Methods in Architecture* (Architectural Association Paper No. 4). Edited by G. Broadbent and A. Ward. New York: George Wittenborn, 1969, pp. 55-70.
- TEKELI, I. Gecekonduhari Planlama Sorunlari ve Yollari (Planning Problems of "Squatters"). *ODTU Gelisme Dergisi*, n.2, 1971, pp. 285-314.



- TERNER, I.D. *Technology and Autonomy. Freedom to Build: Dweller Control of the Housing Process.* Edited by J.F.C. Turner and R. Fichter. New York: The Macmillan Co., 1972, pp. 199-237.
- TERNER, I.D. and J.F.C. TURNER. *Industrialized Housing: The Opportunity and the Problem in Developing Areas.* The Ideas and Methods Exchange (IME) Series, n.66, Dept. Hsg. and Urban Div., Office of International Affairs, Washington, D.C.: Gov. Printing Office, July 1971.
- TOENNIES, F. *Community and Association.* London: Routledge & Kegan Paul, 1955.
- TOLMAN, E.C. *A Psychological Model. Toward A General Theory of Action.* Edited by T. Parsons and E.A. Shils. New York: Harper and Row, 1962 (1951), pp. 279-361.
- TURAN, M. "Environmental Influences on the Evolution of Housing in Hot-Arid and Marine-Cool Regions in the Pre-Industrial Period," College of Architecture, University of North Carolina at Charlotte, October 1972. (Mimeographed.)
- TURAN, M. *Environmental Stress and Flexibility in the Housing Process. Environmental Design Research* (Selected Papers, 4th International EDRA Conference). Edited by W.F.E. Preiser. 2 Vols.; Stroudsburg, Penn.: Dowden, Hutchinson & Ross, Inc., 1973, v.1, pp. 47-58.
- TURNER, J.C. *Barriers and Channels for Housing Development in Modernizing Countries.* *AIP Journ.*, v.33, n.3, 1967, pp. 167-181.
- TURNER, J.C. *Lima's Barriadas and Corralones: Suburbs versus Slums.* *Ekistics*, v.19, n.112, 1965, pp. 152-155.
- TURNER, J.C. *Housing as a Verb. Freedom to Build: Dwellers Control of the Housing Process.* Edited by J.F.C. Turner and R. Fichter. New York: The Macmillan Co., 1972, pp. 148-175.
- VENTURI, R. *Complexity and Contradiction in Architecture.* New York: The Museum of Modern Art, 1966.
- WARD, A. *Rightness and Wrongness In the Physical Environment. Design Methods in Architecture* (Architectural Association Paper No.4). Edited by G. Broadbent and A. Ward. New York: George Wittenborn, 1969, pp. 166-178.
- WEDEL, W.R. *The High Plains and Their Utilization by the Indians.* *American Antiquity*, v.29, n.1, 1963, pp. 1-16.
- WEINSTEIN, P.R., LEUSHIN, P.J., and SHAFIR, A.J. *Physiological and Hygienic Background for Determining Maximum Permissible Noise Intensity in Multi-Story Apartment Houses.* *Gigiencia i Sanitaria*, v.25, n.3, 1960, pp. 23-29.

- WESTON, H.C. Visual Fatigue. *Trans. Illum. Eng. Soc.*, v.18, n.2, 1953, pp. 39-66.
- WHITE, L.E. The Outdoor Play of Children Living in Flats: An Enquiry into the Use of Courtyards as Playgrounds. *Environmental Psychology*. Edited by H.M. Proshansky, W.H. Ittelson, and L.G. Rivlin. New York: Holt, Rinehart & Winston, 1970, pp. 370-382.
- WHITE, R.W. Motivation Reconsidered: The Concept of Competence. *Psychological Rev.*, v.66, n.5, 1959, pp. 297-333.
- WHITE, R.W. Competence and the Psychosexual Stages of Development. *Personality*. Edited by R.S. Lazarus and E.M. Opton, Jr. Middlesex, England: Penguin Books, 1967, pp. 142-166.
- WINGLER, H.M. *The Bauhaus*. Translated by W. Jabs and B. Gilbert. Cambridge, Mass.: MIT Press, 1969 (1962).
- WINKELHAKE, C. "Behavioral Models," Dept. of Arch., University of Illinois, October 1970. (Mimeographed.)
- WORMINGTON, H.M. Prehistoric Indians of the Southwest. *The Denver Museum of Natural History Popular Series*, No.7, 1947, pp. 27-117.
- WURTMAN, R.J. Biological Implications of Artificial Illumination. *Illum. Engng.*, v.63, n.10, 1968, pp. 523-528.
- WYNDHAM, C.E. Adaptation to Heat and Cold. *Physiology, Environment, and Man*. Edited by D.H.K. Lee and D. Minard. New York: Academic Press, 1970, pp. 177-204.
- YASA, I. *Ankara'da Gecekondu Aileleri* (Squatter Families in Ankara). *Saglik ve Sosyal Yardim Bak./Sosyal Hiz. Gen. Md. Yayinlari*, n.46, Ankara: Akin Matbaasi, 1966.
- YORUKAN, T. *Gecekonducular ve Gecekondu Bolgelerinin Sosyo-Kulturel Ozellikleri* (Squatter Settlements and Their Socio-Cultural Characteristics). Ankara: Inar ve Iskan Bak./Mesken Gen. Md., 1968.
- ZUBEK, J.P., SANSOM, W., and PRYSIAZNIUK, A. Intellectual Changes During Prolonged Perceptual Isolation (Darkness and Silence). *Canad. Journ. Psychol.*, v.14, 1960, pp. 233-244.

75

754

MICROFILMED-1975