RICE UNIVERSITY

SOME IMPLICATIONS OF PERCEPTUAL PSYCHOLOGY
FOR BEHAVIORAL DESIGN

by

JOE DAVID WORRELL, III

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Abstract

CERTAIN IMPLICATIONS OF PERCEPTUAL PSYCHOLOGY FOR BEHAVIORAL DESIGN

Joe David Worrell, III

Thesis: That perceptual psychology can aid the architect in translating human behavior, that attempts to incorporate psychology into architecture have largely failed because of inadequate analysis and faulty synthesis of the science's capabilities, and that the proposed incorporation, therefore, should be fully investigated.

Argument: First, psychology is divided into two sections: a) the aggregate knowledge it has accumulated, and b) its techniques and methodology. Five theories are then analyzed under the heading of "Aggregate Knowledge," and grouped as:

The historical theories of behaviorism, Gestalt theory, and psychophysics.

The position of James J. Gibson.

Cognitive theory.

Next, four methodologies are analyzed under the heading "Methods," and grouped as:

The experimental methods.

The alternative methods of the case-history, testing, ex-post-facto procedures, and systematic observation.

Last, synthesis is accomplished by means of the preceding overview.
Discussion: The aggregate knowledge of psychology cannot be directly incorporated into the body of knowledge of architecture, but it can yield hypotheses and insights that provide background and it can structure inquiry by its methodology. Theory substantiates that perception is an active process, and that perception adapts to environmental change; therefore, the behavior that results from perception is not a constant. Methodology can delineate macro-behavioral systems, and the architect can use this knowledge to construct the environment necessary to accommodate these systems. The architect may also use this knowledge to prevent the designing of environments detrimental to society. Accommodation of micro-behavioral systems may be accomplished by expanding environmental choice and inhabitant manipulation of the environment.

Finally, the effective use of psychology - both its theories and its techniques - is dependent upon the development of a dialogue between the disciplines and the emergence of a middleman acquainted with both.
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SECTION ONE. INTRODUCTION TO THE PROBLEM
Chapter 1. Explanation and Introduction to the Problems of Using Psychology in Architectural Design

There exists today a general consensus among the design professions that the behavioral sciences, especially psychology, possess effective instruments for coping with human behavior as a variable in design. This consensus is to be found chiefly in the wealth of articles published in both architectural and psychological periodicals since roughly 1966, and has become an increasingly popular belief as design problems have become increasingly complex. Christopher Alexander has said, "The intuitive resolution of contemporary design problems simply lies beyond a single individual's integrative grasp," thus succinctly stating why so much unrest exists with present methods of explaining behavior in terms which designers can use.

Predictably, psychologists have at the same time turned to architects, recently discovering that they exert some of the same control in the real world that psychologists do in the laboratory. Psychologist Robert Sommer of the University of California at Davis, as titular spokesman for these psychologists, declares that although he has found in architectural periodicals and books many assumptions about the ways design can affect the human, none of these assertions has been subjected to systematic evaluation. He concludes that the entire art of design must rest on exceedingly weak underpinnings.
The situation, then, is one in which both architects and psychologists advocate the use of the behavioral sciences in design. That this union has been neither extensively nor very successfully promoted is a confirmable fact.\(^3\)

However, with clear evidence that collaboration between architects and psychologists is imminent, even occurring now,\(^4\) that both professions misunderstand what the other is capable of delivering,\(^5\) and that, "...the direct response of the spirit to the sensory perception of the environment...remains almost virgin territory..."\(^6\), I propose that the validity and use of behavioral psychology for architectural design should be investigated.

Time available for research is an immediate limit to such an investigation. An additional limit is my assumption that human behavior is best analyzed through the psychology of perception. This assumption exists because architects today seem concerned yet uncertain about how they affect the human in their built designs and what kind of influences they exert on him. Since psychology is the science of behavior, and since human reaction to human perception is the unknown variable, perceptual psychology is assumed to be the key to understanding that variable. The thesis will contain no original research, experiments, nor data in the scientific sense. The goal will be, instead, to analyze what perceptual psychology may offer design by investigating available information on the subject. One fact determining the major directions of the investigation is that psychology,
like any science, has potential information in two broad areas, aggregate knowledge and methodology. The body of aggregate knowledge contains all the information, theories, facts, and functional relationships of the science. The methodology contains all the procedures and techniques that contribute to the body of knowledge. This paper, therefore, pursues both approaches for their validity in translating human behavior for architects.

Perceptual psychology provides the start of the investigation but by no means limits its scope entirely, principally because the methods and theories of psychology do not fit so neatly into any one category. Perception will then initiate and guide the inquiry, but will not limit it.

The task of the thesis may now be stated: to review available information on perceptual psychology and on its proposed incorporation into architecture as a design instrument; to categorize this information into the aggregate knowledge/methodology format; lastly, to utilize this overview to advance reasonable proposals as to how this psychology might be best employed in those design disciplines concerned with human response.

The paper will be divided into four sections. The first is the introduction; the second and third constitute the body of the thesis; and the last section is the conclusion to the paper. The second and third section of the paper will investigate respectively the aggregate knowledge and the methodology of perceptual psychology. Each will have its own brief introduction.
There remains a comment on the nature of the current articles written on behavioral design through psychology: it seems whenever any person discusses the incorporation of certain elements of psychology into architecture, that discussion is invariably synthetic; there has been little analysis of the problem. The difference between analysis and synthesis is that analysis seeks to state a problem; synthesis seeks its solution. Much has been declared on the solution, but little on the explicit problem. This paper, therefore, includes analysis and synthesis and maintains that both are vital to the understanding and solution of the problem at hand. Where analysis occurs and where synthesis occurs in this paper is shown in figure 1.
Introduction

Aggregate Knowledge

- historical theories
- Gibson's theory
- cognitive theory
- summary

Methodology

- experimental methods
- alternative methods
- summary

Conclusions

*areas of analysis contained out of dotted line
areas of synthesis contained within dotted line

Figure 1. Graphic Delineation of the Thesis, Including Areas of Analysis and Areas of Synthesis
SECTION TWO. ANALYSIS OF THE AGGREGATE KNOWLEDGE OF PSYCHOLOGY
The second section of the paper initiates the investigation with an examination of the broad theories, some of the facts, and some of the functional relationships found in the accumulated knowledge of perceptual psychology. The aim is to describe how they might help the designer as well as how they cannot. This information is discussed under three distinct headings, but these headings are to facilitate analysis only. These theories may be cataloged in a variety of ways, and are quite similar in some respects though quite different in others.

The first category contains those theories labeled the historical theories merely because they predate the cognitive psychology that has developed since 1960, a psychology stressing information processing analogous to computer data analysis. The historical theories include behaviorism, Gestalt theory, and psychophysics.

The second category is a position, rather than a distinct theory, from which James J. Gibson surveys present theory. Gibson states that the misunderstanding of perception could be resolved if the emphasis were directed to the study of the senses as systems and to the study of the role of the mediating mind in perception. For these reasons, his position on perception is considered transitional from past theories of perceptual psychology to current cognitive psychology.
The last category is that of contemporary cognitive psychology. Cognitive theories accent the role of perceptual mediation by the mind and are partly comprised of information processing theories that quite closely parallel the information theories of computer science. The theory has been principally developed since 1960.

As a final statement, the point must be made in advance that some of the conclusions discussed in the summary appear "commonsensical." The crucial feature of these conclusions is that they are subject to the veracities of the science of psychology, while common observation is often clouded by irrelevant events.
Chapter 3. Analysis of Three Historical Theories of Perception

This chapter, covering facts and theories derived from the historical positions in perceptual psychology, describes behaviorism, Gestalt theory, and psychophysics. Behaviorism and psychophysics conventionally have emphasized relationships between observable events, not because of any compelling philosophical reasons, but because of operational ones. Psychology, in its early development, became sensitive to questions concerning its validity as a science, and for that reason de-emphasized introspection and theories dealing with unobservable events such as occur in the mind. Gestalt theory, on the other hand, deals very directly with the mind, with its emphasis on attributes of stimuli and methods of perceptual organization. Still, Gestalt theory is placed in the same classification as behaviorism and psychophysics because it lacks the concepts of contemporary cognitive psychology, and, therefore, while its observations seem accurate, it provides no real predictive theories about how this organization is accomplished. A partial description of these theories is necessary to understand their abilities and failures in enabling the architect to understand or specify behavior that results from perception.

Behaviorism. The conventional approach to perceptual psychology, as outlined by such psychologists as William Dember, defines perception as "responsiveness to input". In other words, do environ-
mental stimuli result in any way in overt behavior? From this definition, experimental and theoretical interest naturally turned to the study of minimum detectable levels of stimuli and of minimum detectable differences in all types of stimuli to which organisms were subjected. These differences are termed the *threshold of sensation* and the *just noticeable difference* respectively, and correspond, for instance, to the amount of light barely detectable by the eye and to the smallest change in the amount of light the eye will notice. This emphasis provided opportunity for a large number of experimental observations and theories, and consequently a volume of information on the measurement of these thresholds, both in physical terms in the case of the stimuli, and in physical and psychological terms in the instance of the response.

These theories and experiments provided a number of notable observations that are of consequence for the theory itself. The first observation is that groups of stimuli contain common attributes, but in a psychological sense rather than a physical one. There seems to be little correlation in physical dimensions. An example is the ability of the mind to classify and scale the sounds of speech, an impossible task in terms of physics.

The second observation is that stimulation results in perceptual organization; in fact, a change in stimulation is necessary for perception at all. If, for example, the tiny scanning movements of the eye are stopped, vision is interrupted.
The last observation is the demonstration of intramodal and inter-modal contextual manipulation. The first illustrates the feedback that exists between a stimulus and its context; a color is seen to be redder if in its context it is supposed to be red, as an apple. The other phenomenon is not very well understood, but demonstrates there must be some sort of causal relationship between the senses. Different tones in headphones have affected visual thresholds in various degrees. In the first instance, this means that a psychologist interested in scaling psychological reaction to a series of tones increasing in pitch will have a distorted reaction scale if different tones are presented in different contexts. The second instance provides strong support for the theory of sense systems, but as was stated before, the phenomenon is not well understood.

William Dember declares there can be little doubt, in view of these observations, that perception cannot be understood by physics alone, and that environmental stimuli do not fall on a passive organism. Further, if perception is an active process, feedback exists between environmental stimuli and the subject, extending even to complex social stimuli. Behavior and perception are often that which is socially acceptable. The wealth of theory and information available from the historical theories cannot be taken from laboratory context because the mind in the real world influences perception so much that it makes these theories untenable in the face of large numbers of variables.
**Gestalt theory.** Two other broad, but different theories must be mentioned at this point, Gestalt theory and psychophysics. Gestalt psychology maintains that experience does not consist of discrete stimuli, but that mental phenomena are organized wholes, in which the whole is greater than its sum of stimuli parts. One such "whole" is the idea of a circle existing independently from the stimuli that provide its structure; for instance, the circle formed by children holding hands. 14 Gestalt theory, in this way, does stress mental mediation of experience. The theory has had an especially pronounced effect on the arts because of its pronouncements on what constitutes "good" and "bad" form, and on what the tendency of mind and eye to see is. The theory suffers, though, because most of its theorems are basically acute observations. The way the mind processes such information is important to the proponents of the theory, but never very adequately explained. In fact, psychologist Wendell Garner suggests good form may be the opposite of Gestalt because it is more complex. 15 If Gestalt observations seem accurate, but no judgment can be rendered about whether a Gestalt form is pleasing to the beholder or not, then applications of the observations in the form of theory is limited.

**Psychophysics.** Last, there remains the theory of psychophysics. Specifically, its thesis emerged in the early days of psychology when the emphasis was on measurement of observable happenings in perception. As the name suggests, many of the concepts in physics about the structure of light and sound are used by psychophysics in deter-
James J. Gibson's transitional theory, as promoted by his book, *The Senses Considered as Systems*, describes a position in psychology transitional from the historical theories to modern cognitive perceptual theory. Gibson proposes primarily that the human organism and the environment impinge on each other, and that the human actively synthesizes his own individual reality. Response, therefore, must be understood through stimulus, context, and the senses considered as systems. Development of his theory is necessary to explain:

a) what Gibson means by the "senses as systems", b) that Gibson developed this work primarily as a tentative explanation of the mediation of perception by the mind, not as a predictive theory, and lastly, c) what Gibson's position might provide in understanding or specifying perceptual behavior.

Uniquely, Gibson considers literally the entire world and all of its furniture when he refers to perception. That is, whatever perception may be, it is related to the world as man evolved in it, essentially unifying physics, geology, biology, archeology, and anthropology, calling it ecology, and using what can stimulate a sentient organism as the unifying element.

Central to this definition is the proposal that all perception is an orienting system serving to pick up information about the environment
to insure biological survival. 18

Accordingly, obtained perception and obtained proprioception become base theorems upon which to construct broad theory, rather than variables which alter laboratory conditions. Obtained perception is exemplified by the active act of listening or looking, while obtained proprioception is exemplified by the act of walking or feeling in order to obtain internal clues (muscular tension and bone angles, for example) to the environment. Also, this orienting system of the organism does not exactly contain the senses of taste, hearing, smell, or the other classic senses, but has interlocking organs of active attention that are truly systems. The senses act together to report events of interest to the involved organism.

Since the senses must be systems whose function is to extract information from the world at large, Gibson's observations have led him to believe the mind and the senses do this by searching for invariants in the structure of environmental information. 19 That is, to insure survival, the senses and the mind seem to be only interested in those events that do not violently and unpredictably oscillate. The organism can exhibit behavior that will sustain his well-being if he can establish a causal link in the way he sees something, and what happens to him when he reacts to it. That link is firmer when anchored to relevant or invariant events. Gibson states:

The intricate apparatus required for auditory perception evolved only because information about distant vibratory events could be picked up by animals from the vibration of the medium. The information is carried not by the
variables of sound emphasized in physics, but by the invariants of the wave train and the geometry of its front. 20

Visual systems developed in order to take advantage of the information in ambient light. 21

Scanning is a method of obtaining information, and the system apparently searches for invariants in this scanning process. 22

At this point, a significant concept may be introduced that was implied in the earlier historical view of perception. Gibson is convinced, through his experiments, that because the perceptual system functions to extract and synthesize invariant information from the environment, a change in that invariant information has to result in the eventual involuntary restructuring of the way the organism synthesizes that information in order for it to continue to survive. 23

At one level, synthesis is an involuntary adaptive process, perceptual change is a function of time and stimulus change (Helson's concept of this function is graphed in figure 2), 24 and perception is dependent upon the make-up of the individual's synthesizing processes. At another higher level, "synthesizing processes" correspond to the cognitive processes as proposed by cognitive psychology.

There are numerous implications for those who would see the theory as a behavioral indicator. A primary observation is that the position seems certainly closer to a representation of real world perception than perhaps the older concepts of perception, but it also seems not yet quite explicitly developed to aid designers in identifying human-environmental interplay expressed as behavior.
deviations from the norm stimulus are negative
deviations from the norm stimulus are positive

effects are positive on the involved organism
effects are negative on the involved organism

Figure 2. Typical Adaptation Curve (from Helson)
The following observations offer an accurate appraisal of what it does present: as in the historical development of perception there is a danger of removing any of Gibson's theories or models from textbook context; perceptual behavior results partly from the fact that none of the human senses act independently; and perceptual behavior is partly the result of adaptability of human perception to environmental change, that is, how the human synthesizes reality involuntarily changes with gross environmental stimulus change. There is much implied in this last statement that will be further discussed elsewhere in the paper, but it essentially explains the acceptance of the bizzare as normal after enough exposure to it. From the Winter 1967-68 issue of Landscape, "The architect is still, even among the youngest generation, unable to accept the fact that the radical postwar changes in building styles might be nothing more than a search for visual novelty and a reflection of restless and rapid cycles of taste."25

The position advocated by James J. Gibson is transitional from the historical concepts of perception to the type of cognitive psychology that has arisen since the early 1960's. Gibson emphasizes perception as an evolutionary product, where all the senses combine as systems to extract invariant information from the environment to promote and insure biological survival. Although this position seems more realistic, it again does not allow insight into specific behavior. However, it does provide two broad postulates of what partly determines perceptual behavior; that the senses are systems and that
perception is a very fluid, dynamic, and adaptive process.

Because a more developed theory is still needed, and because Gibson's "synthesizing processes" emphasize the extensive role mediation by the mind has in perception, the next position to be examined will be that of contemporary cognitive perceptual psychology.
In this last position, that of cognitive perceptual theory, the emphasis is on the mediating mind, on the intervening variable rather than the external observables. It is this position which is currently eliciting most interest and generating most work among those psychologists whose field of interest is perception.

The general thesis of perceptual cognitive psychology is advanced in Ulric Neisser's book, *Cognitive Psychology*. Briefly, these psychologists have concluded that behavior that results from perception has no real chance of being understood merely through correlations of various stimulus-response functions. They believe, as did Gibson, that since the perceiving processes of the mind are both active and adaptive, these processes must be understood before relations between external observables can be understood. Neisser's definition of perception and cognition reflects this: "As used here, the term 'cognition' refers to all the processes by which the sensory input is transformed, reduced, elaborated, stored, recovered, and used." Once more, elaboration on the cognitive position is necessary to illustrate whether it may or may not enable the designer to deduce certain specific behavior from certain environmental stimuli. Principal in this discussion is, Neisser feels, that the approach is both realistic and promising in its analysis of everyday perception,
and that most of its difficulties in pragmatically applying its theories center on experimental inability to properly cope with the large numbers of functions that occur in the human mind.\textsuperscript{28}

Essentially, the problem of perceptual cognitive psychology is how the mind works.\textsuperscript{29} Contemporary psychologists have made extensive theoretical use of the program analogy; that is, the mind for operational purposes can be said to contain recipes for, "...selecting, storing, recovering, combining, and generally manipulating (information)."\textsuperscript{30} These recipes are referred to as programs. Pertaining to this, Neisser comments, "Information is what is transformed, and the structured pattern of its transformations is what we want to understand."\textsuperscript{31} The problem is how the brain and the senses translate all the information they receive.

There is an oblique reference here to the branch of the informational sciences which are involved in computer programming. In fact, cognitive psychology has borrowed rather freely from computer technology, using such terms as "parallel processing", "feature extraction", "series processing", and "analysis by synthesis". The first and third terms are graphically depicted in figures 3a and 3b. As Neisser points out, however, the analogy is only to provide simplistic models, not to explain the complexities of the mind. "In my opinion", he declares, "none of them (the programs) does even remote justice to the complexities of human mental processes,"\textsuperscript{32} and, "If the account of cognition is even roughly accurate, it will not be simulated for a
"analyzers of the mind" corresponding to learned features of the environment
data accepted by the senses

a. parallel processing

Figure 3. Data Processing by the Brain (representative)
long time to come." Also worth mentioning is that the use of programming analysis is by no means confined to cognitive psychology. Rather curious, even significant is the fact that the same thing is being done in the design disciplines. Chrostopher Alexander in his Notes on the Synthesis of Form has begun a movement by employing the same sort of rationale in describing the forces that produce form on any scale. The term program is being more and more frequently used, especially in urban design.

Historically, there have been several of these programming approaches to the processing of information by the human mental facilities, and it would be well to briefly examine them to determine their impact on the designer's question of psychology. The first of these, most readily identified with visual pattern recognition is template matching, a notion found in some forms of Gestalt theory. In it, patterns of stimuli correspond to like patterns of neural activity in the visual perceptual system, figure 4. Because of the difficulty in explaining such phenomena as mental size constancy despite increases in distance from the viewer of the stimuli, and changes in stimuli orientation with regard to the visual template, processing is conceded to be more complex.

Template matching then provided the context for the development of feature analyzing theorems, an example being that possibly all the visual system searches for in identifying a "Q" as distinct from an "O" is the feature of the small leg of the "Q". The theorems maintain
mismatch occurring when size of stimulus is reduced by distance
mismatch occurring with incorrect location of stimulus
mismatch occurring with incorrect orientation of stimulus

*front plane corresponds to template of neurons
rear plane corresponds to template of stimulus

Figure 4. Simplistic Template Matching
that if template matching is inadequate, there must be mental processes which analyze pertinent features of stimuli, to which Neisser replies, "Such theories have many advantages, but they too will need considerable elaboration before they explain the observed facts." 36

A partial answer to the need of such elaboration is found in what is called series processing of information, one of two ways feature analyzing may be conducted. This merely means, figuratively, that the brain searches for the meaning of the leg stimulus of the "Q" in a linear fashion. If this sort of information were executed in the mind sequentially, as in figure 3b, the task would be time consuming and subject to error, as it sometimes is.

Parallel processing, as an alternative, seems to exist at least on some levels in the mind. Here, the search for what the leg on the "Q" might stand for is done simultaneously among many different areas until a match is found. It is apparently just as easy, for example, for the human to search for ten letters in a nonsense list of words as one letter. A model of parallel processing is shown in figure 3a, from Selfridge (1959) as depicted in Cognitive Psychology. 37

Appropriately, the consensus is that information processing by the mind, an example being feature analyzing, occurs in both modes, series and parallel. Attention seems to occur chiefly in series. One notices the visual field in the forefront, then a room, next a desk, and last perhaps the book, word, letter, and feature of the letter. The brain meanwhile processes the features of the stimuli in each
span of attention in parallel.

These are valid insights into perceptual behavior, but the conclusion has to be that although the programs of the mind that the cognitive psychologists envision might be sophisticated, even roughly accurate, they are not explicitly enough developed to allow their use out of laboratory context. If perception and behavior are linked, how synthesis occurs (how the mind is programmed) must be approximately known before behavior that results from it can be ascertained. Even cognitive theories do not offer this. Knowledge of the human mental processes seems to be in the distant future.

There are two observations to be made, and the first might be the most important: this information and theory cannot be directly incorporated into the body of knowledge the design disciplines have. The second is the same observation made in the preceding chapter on Gibson: the mediating processes of the mind must be understood before there can be any consistently accurate statement of the functions between behavior and environmental stimuli.

Reviewing what has been said in this chapter, cognitive perceptual psychology emphasizes the importance of the perceiving mind in perception and explains its processes by programmatic models. Although Neisser believes some of these models are analogous to the cognitive processes, they are not satisfactorily complex to simulate the intricacies of the human mind. The models cannot predict specific human reaction to a space or a structure, for example. The only broad postulate of importance to the architect is that perception must be understood
through the cognitive processes of the mind.
Architecture

*the techniques and methods of psychology and how they fit into the diagram will be discussed in Section Three

Psychology

*the techniques and methods of psychology and how they fit into the diagram will be discussed in Section Three

Figure 5. How the Aggregate Knowledge of Psychology Might Be Used in Architectural Design
Chapter 6. Limitations and Potential Uses for Perceptual Psychology's Aggregate Knowledge in Architecture

From the previous three chapters, in summary, come several observations about what kinds of impact on designers, planners, and architects the aggregate knowledge, assemblage of facts, and functional relationships of perceptual psychology might have.

These observations were: first, most of this information can be no more than insightful and interesting, largely because perceptual mediation by the mental processes in the real world is complex enough to negate any very specific link between what people discern, see, hear, or feel and the way they consequently behave; and second, perceptual psychology does have a number of general postulates about what in perception determines gross behavior which seem indisputable. These postulates indicate that behavior is the result of active synthesis, the senses acting as systems, the adaptability of perception to environmental change, and intensive mediation by the mind.

The body of knowledge provides, then, a key to understanding what shapes behavior, but it in no way adequately enables anyone to describe or forecast behavioral specifics in the real world. The majority of today's articles written by persons interested in the behavioral sciences (architects are primarily guilty of this) expects just that, and any number of these authors have issued a call-to-arms on a wide variety of currently popular theories. The idea of complexity, novelty,
and ideal stimulation has received attention from such persons as architect Amos Rapport, who has advocated an open-minded, complex involved and illusive building; and psychologist Joachim Wohlwill, who even defines the dimensions of complexity as intensity, novelty, complexity, temporal change, incongruity, and surprisingness.

On other fronts, Robert Sommer declares, "There is no behavioral evidence to justify any ceiling other than that which accommodates a tall man wearing a hat" and suggests that man may need a natural bio-type, an ideal environment. Faber Birren in the article, "Color and the Sense of Space", says, "Most people will have a better memory for color than for form." C. G. Jung is even convinced that an individual's piece of land is of such importance as to be psychologically irreplaceable by anything else.

All of these statements are very strong ones, and have clinical and laboratory evidence to substantiate them, but as has been repeatedly said, these same statements cannot be taken at face value by designers who wish to construct concretely from them. The relationship between the psychologist's laboratory and the world is too tenuous at present. The tragedy is that precisely this is happening, and the results have been disastrous as case-histories, particularly in urban renewal, will attest. One such example is the re-development of the Boston West End by the Boston Housing Authority. Sociological-psychological theory has declared in the past, supported by the studies of the University of Chicago's Robert Park, in the 1920's, that physical
deterioration and social disorganization are correlated. The Boston Housing Authority assumed this was true and also assumed the solution was physical renewal, and subsequently implemented such a plan. Herbert Gans later discovered the area was not a "slum", but inhabited by blue-collar workers living there because of friends and low rent. With renewal followed by higher rents, they were forced to move, made extremely unhappy, and, in some cases, developed psychoses.\textsuperscript{44}

How, then, may all this assemblage of theories and facts be used by those in the design professions? Previously discussed were several postulates contained in the general theories of perception. These theories, and to some degree many of the minor experimental observations, perform as very valuable background to structure, to influence, or to provide format for scientifically founded observation or experimentation. Robert Sommer, declaring in \textit{Personal Space}, "A designer would profit more from training in the techniques of systematic observation than in the empty rituals included under the category of experimental design",\textsuperscript{45} is effectively saying this.

This implies a specific use for the body of knowledge of perceptual psychology in environmental design, and a rather defined role for the design professions also. The implication is graphically depicted in figure 5, which implies that the body of knowledge of perceptual psychology would serve as an input between the methods of architecture and the body of knowledge that architecture has, thus indirectly influencing the gross knowledge of the design fields. This is an important
The confirmed postulate that perception is capable of rapid restructuring with environmental change means two important things to the architect. The first is that since presently no one can accurately forecast long-range changes in the environment, it seems equally certain that long-term perceptual changes will be as difficult to foresee. The second is that the behaviorists and designers will have to inquire now about what types and kinds of behavior result from the way people see the world (synthesize it) at a point in time. Whether the architect should view his role in long-term perceptual change as active or passive is debated in Section Four, which discusses some implications and uses of psychology's aggregate knowledge and methodology.

The body of knowledge of perceptual psychology provides a structure and a background for scientific observation, research, and inquiry into behavior; and it has defined that if behavior that results from perception is to be understood, perception must first be placed in the context of a point in time.
SECTION THREE. ANALYSIS OF THE METHODOLOGY OF PSYCHOLOGY
The statement was made in the introduction to the aggregate body of knowledge that categorizing this knowledge of perceptual psychology for purposes of discussion was difficult because of the amount of overlap between various theories. This overlap extends to the techniques of psychology, and it is difficult to analyze the techniques and methods without mentioning specific theories. For instance, techniques that are especially developed for use in a particular theory can be successfully used by any other theory. An immediate example is that the methods of psychophysics could be used by a psychologist interested in the cognitive processes. This psychologist might use an instrument to vary the amount of light a subject is viewing, attempt to correlate physical changes in the amount of light with some corresponding psychological dimension, perhaps a "just noticeable difference", and be searching for a way in which the mind processes the changes.

The way the methods are cataloged, therefore, is only to enable them to be discussed in an orderly manner, and would very likely be recognized by some psychologists, but not by others. Before any specific category is mentioned, some background on psychology as a science must be given.

Science might be described as application of the scientific method
to problems that are solvable by empirical means. This, of course, requires definition of the scientific method, of which the most powerful application is experimentation. In explanation, when a problem is formulated, its only requirements are that it must be solvable and testable. A solution is proposed in the form of a hypothesis, and whether it is true or false is tested by a suitable set or collection of data.

This is the general method of science and the general method of the science of psychology. Basically, data collecting techniques in this paper are broken down into those that are experimental and those that are pronounced simply "alternatives". A laboratory experiment, for example, in which a sound wave is modulated for a subject is experimental, whereas the collection of data in observing children playing is naturalistic and, therefore, an alternative to experimentation. The difference, as it is used here, is that in strict experimentation the experimenter controls all environmental conditions by direct manipulation rather than by careful selection. Both methods of assimilating data are equally valuable to any form of psychology.

Even here, there is some overlap, but for discussion purposes the techniques and methods of psychology will be categorized as experimental and alternative. Techniques that are specifically discussed under each category are representative, and thought by both architects and psychologists to be those that are potentially useful for the design professions. There will be two chapters of analysis and one
chapter of summary in this part of the paper.
Experimental methodology is a basic part of psychology as a science, and serves to broaden and to add to the general body of knowledge. Psychological experimentation had its inception from the earliest days when the instruments of physics were altered or used directly to explore perception and sensation. This early use of the tools of physics underscores the adaptibility of the general scientific method. The method of data collection or the operational details of the experiment are any the experimenter may choose as long as the criteria of solvability and testability are met. A psychological experiment, state Kimble and Garmezy in General Principals of Psychology, has as its goal, "... to discover differences in behavior that can be attributed to differences in the conditions to which the organism is exposed." Essentially, experimentation manipulates environmental conditions to observe their effects directly on behavior.

The one characteristic that all experimental methods have in common, as given by F. J. McGuigan in Experimental Psychology, is that the variables being evaluated are purposely manipulated by the researcher. This deletes other equally effective ways of collecting data, the case-history, psychological tests, ex-post-facto procedures, and systematic observation. These methods will be discussed later.

The distinction is sometimes faint, and an example as given by
McGuigan would be illustrative: a study of learning speed versus age is not technically an experiment, but systematic observation, because the researcher has no way to manipulate the independent variable, age.  

To reiterate, any experiment consists of: a) a statement of the problem, b) a statement of the hypothesis, c) a definition of the variables, and d) a method of data collection. Psychology has many particular methods of data collection, and even standard experiments for obtaining certain kinds of information. Rather than attempt to analyze the various methodologies, several illustrative examples will be given in this chapter to help define the usefulness and the limits of the experimental method to the design fields.

A classic tool of the psychologist is the tachistoscope, an instrument capable of presenting visual patterns, pictures, or light forms in varying time lengths down to a point of no sensation for the viewer. Typically, this instrument has been involved in such experiments as determination of visual pattern structure. Dr. Kenneth Craik, of the University of California, suggests that the designer might use this in an experiment to determine affective qualities of certain environments by brief exposure to pictures or slides of the scene, thus identifying certain salient features.  

A similar instrument, again used in visual presentations, is the eye-movement camera, a device that monitors movement of the eye to include dilation of the pupil. The camera has been used to study the
scanning process of the eye, and recently has been used to illustrate that there occurs some contraction of the pupil of the eye to unpleasant views, and a dilation to attractive or pleasant views.\textsuperscript{50} Again, the implications for an experiment demonstrating what a subject considers pleasant or unpleasant in the environment is obvious.

With the emerging sophistication of simulation, an example being Rice University's Robert Sobel and his demonstration of "dynamic simulation" by television, another means of experimentation is becoming available.\textsuperscript{51} Heretofore, no means of manipulating the large-scale environment existed, but if simulation becomes refined enough, think both Dr. Robert Sommer\textsuperscript{52} and Dr. Kenneth Craik,\textsuperscript{53} this will be possible under laboratory conditions, and the resulting behavior will therefore be subject to refined analysis.

The point is that psychology has standard experiments and a variety of means to conduct other experiments in the pursuit of behavioral knowledge. Psychology also has the means and personnel to interpret data that are found whether for the architect or the psychologist. But, there remain important qualifications for experimental techniques which must be discussed.

The experimental method cannot be used, for example, in instances where it is impossible to produce the events that are to be studied in the lab, as in the study of the effects of brain damage in humans. An additional criticism is that the mere act of bringing some events into the laboratory changes their structure. Only when all pertinent variables have been identified or isolated can an understanding of the
natural event be accomplished. However, according to McGuigan, this is often not accomplished. The experimenter has not been able to transfer the event to the laboratory, but has, in effect, reproduced another event. To this criticism there is no real answer; experimental validity lies in the skill of the experimenter. If the event is for any reason not reproducible in the lab, there still remain the methods of the case-history, testing, ex-post-facto procedures, and observation.

Summarizing, the scientific method of experimentation has been and is extensively used by psychology in all of its forms. From the tools and experiments of physics principally, psychology has developed an entire spectrum of its own methods of data collecting and analysis, still within the boundaries of the criteria of experimentation, solvability and testability. From some of its methods of data collection and from some of its experiments come important implications for experiments concerned with environmental behavior. Modification of basic tools and experiments could result in ways of determining what people perceive as desirable or undesirable in the environment. There are, last of all, inherent limitations to the experimental techniques, the main ones being: a) when events that are to be studied cannot be produced directly, and b) when the event may not be brought into the laboratory without altering the event. The alternatives to the experimental method will be discussed in the next chapter.
The alternative methods and techniques are identified principally by the fact that they select, not manipulate conditions impinging on the subject. As previously stated, the alternative methods are as equally accepted and as widely used as the experimental methods. Under this heading come such varied procedures as the case-history, the construction of psychological tests, ex-post-facto experiments, and a general heading of systematic observation. Some elaboration of these alternative methods is necessary to show in what way they may prove valuable to persons interested in perceptual behavior.

A good example of extensive use of these alternative methods is found in the science of sociology, which is concerned with the effect of prevailing cultural and social institutions on behavior. These institutions are naturally not subject to manipulation by the interested experimenter.

**The case-history.** Most familiar to sociologists and probably architects is the case-history. Clinical psychologists, in the study of personality disorders, use the case-history extensively. Many sociological studies are also case-histories, Herbert Gans' *The Levittowners* being such an example. The technique usually involves compiling a well-documented case of some historical event and subsequently correlating happenings in the event with other factors such
as motivation, perception, or any of a variety of hypotheses.

However interesting case-histories are, they contain inherent deficiencies. The first of these is that the case-history is retrospective and therefore subject to distortion through selective loss of memory and repression. Since the methods of science are constructed to deal with repeatable events, case-histories are sources of trouble in that they are unique. Last, the case-history, unfortunately, is open to a wide variety of interpretations. There is a distinct tendency to read what is desired into the analysis.

One important advantage of the case-history is that the observer is supplied with a rich source of hypotheses that can be later tested by methods involving closer control. That the case-history is a rich source of hypotheses about behavior is significant for the architect.

Psychological testing. As well known as the case-history methods is psychological testing. On a general level, testing seeks to identify individual differences across a wide spectrum of classifications. In the context of isolating individual differences, these tests are perhaps of limited use to those interested in group reaction to broad environmental stimuli conditions. Dr. Craik has suggested that if these tests were instead used to identify group similarities, they would become useful tools to behaviorists and architects, and he has, in fact, in his article "The Comprehension of the Everyday Physical Environment," outlined standard psychological tests and how they could be modified for architectural use.
These psychological tests can be considered as classifiable in a variety of ways. The first of these classification systems is based on the type of behavior these tests are supposed to measure. In this system, a test could be a personality test, a test on vision, a mechanical test, or even an art test, depending on what behavior was being emitted for scaling.

Psychological tests may also be classified as either tests of aptitude or tests of achievement. The classifying of tests in this manner results in rather indistinct categories because many tests can measure the amount of some particular skill a person has and use that same score to predict future performance.

The category of paper-and-pencil tests versus performance tests may also be employed. There are many tests, for example, that involve some sort of motor manipulation of blocks, pegs, or mechanical objects. Written tests are most common in educational institutions.

The fourth classification of tests is called the speed and power category. In it, two types of tests are found, the test in which speed is the phenomenon being graded, and the test in which accuracy is at a premium and time inconsequential.

Individual and group tests constitute the next classification. The Stanford-Binet Intelligence Scale, for instance, is designed to be administered individually. Group tests are those that can be administered by one person to large numbers of people.
The last potential classification is between language tests and non-language tests. The chief reason for the existence of the non-language tests is that there may be situations where language ability influences a test that does not desire to test language aptitude. Illiterates would be excluded from certain industrial jobs if high performance on written mechanical aptitude tests were an occupational criterion.

The overview provided by the diverse ways of classifying psychological tests illustrates that most dimensions of human behavior can be scaled by some test and consequently underscores the importance of testing to psychology. As Craik has said, many of these tests could be modified to reveal group preferences for certain environments or for certain group values, but there remains an additional problem of psychological testing. The constructs on which they are based are sometimes ill-defined. Dimensions of personality fall into this category, and any test that inventories personality to predict response to the environment is weakened by that fact. In other words, if there is to be correlation between test scores and success in predicting environmental behavior, the test must scale defineable and consistent dimensions. Tests are important to the behaviorist because to recall Craik again, they are easily modified for a variety of circumstances.

Ex-post-facto procedures. The ex-post-facto procedures are also alternatives to experimentation. An example is the best illustration. If a researcher would like to determine what can be learned while sleeping, samplings of what is being learned cannot be taken while the subject
is asleep; obviously, observations of what is learned must occur at a later time. Because what is learned is sampled after it occurs, intervening events may distort results.

*Systematic observation.* There remains only the host of alternative methods that fall under the general heading of systematic observation, whether in the field or in the laboratory. Events are studied naturally, and as they occur. Naturalistic observation is in this category, and there has been recently a renewed interest in it, even spawning a psychology called "ecological psychology", which is defined and proposed in a book by the same name. This, informally, is what architects have been hard at work at with the advent of the interest in behavior, and possibly what they could profit most from. Systematic observation is one additional method of data collection, and is, therefore, no better refined than the procedure and context it is put in. Robert Sommer has strongly suggested that design disciplines utilize naturalistic observation systematically and objectively.

One architect who has used systematic observation in a rudimentary way is C. M. Deasy of Los Angeles. In a most convincing article, "When Architects Consult People," he demonstrates its ease of adaptation and its effectiveness. He merely "took to the streets with a camera, note pad, and a try at objectivity." Deasy relates his problem was a typical one: his client balked at playing de Medici to the arts, and demanded that if a plaza in front of his building was to be built, it should draw customers. "Designing a beautiful plaza," declared Deasy, "was
Designing one that would attract people was a different matter, he concluded. By utilizing systematic observation, Deasy solved the problem, and did so effectively. "The result isn't exactly elegant, but it has a tremendous vitality and an esthetic quality of its own." However such observation is used, it is absolutely essential that it conform to scientific method, that is, it must stay objective and systematic, and above all, establish as much control of observations as possible. That is, any intervening events must either be eliminated or accounted for. If not, the observations will be so distorted by unknowns that they will be invalid descriptions of the event under analysis.

The alternative procedures, the case-history, psychological tests, ex-post-facto procedures, and systematic observation are perhaps most significant for the designer because these procedures can be easily utilized, and in fact are being utilized by the design professions in an informal and rather quasi-professional way, as exemplified by Deasy's successful work in Los Angeles. The case-history is a source of many hypotheses about behavior; psychological tests are flexible enough to be altered for use in studying environmental behavior; and naturalistic observation is both simple to use and effective.
Chapter 10. Potential Uses of Psychological Methodology in Architectural Design

From the previous two chapters on the techniques and methods of psychology came several important observations of significance for the designer interested in human behavior. After examining both the experimental and the alternative procedures of applying the scientific method, both were found flexible enough to be modified for use in determining what everyday behavior might be because of perception, and both were found to have inherent limitations.

The experimental method is qualified by the ability of the designer of the experiment to manipulate any of the variables. The example was given of the commonly used tachistoscope and its use in the lab to present visual stimuli for varying lengths of time. The general experimental method consists, it was determined, of a problem, a hypothesis, and a method of data collection, the only criteria being that the problem must be solvable and testable. Psychology started with the data collecting methods of physics, and today has its own techniques of data gathering. The statement was made that these techniques can in turn be modified for those interested in gross, day-to-day behavior. The limitations of the experimental method were listed as a situation in which the experimenter cannot manipulate all variables, as in the study of the impact of social institutions, and as a situation in which the event to be studied is transformed into another event by bringing it into the laboratory.
Figure 6. How the Aggregate Knowledge and the Techniques of Psychology Might Be Used in Architectural Design
The alternatives to the experimental technique were the case-history, the psychological tests, the ex-post-facto procedures, and the general heading of systematic observation. These procedures sometimes incur more difficulty from distortion by intervening events because environmental conditions are selected instead of manipulated.

The case-history is subject to personal bias and misinterpretation, but it provides a rich source of hypotheses about behavior that can be tested later. Psychological tests presently are for screening individual differences, but they are easily modified and can be used to screen for group similarities or to serve as preference indicators. The last procedure, systematic observation, is thought by some psychologists most easily adapted to the designer's needs and the method most immediately promising, provided those who use the method apply sufficient objectivity to validate its results.

Frankly, the present emphasis in the study of environmental behavior is on systematic observation. This seems rather natural in light of the trend towards bias in the case-history and in light of the difficulty of removing natural events to the laboratory. Perhaps one of the most interesting of the few experiments on the environment that has been performed was done by Abraham Maslow and N. L. Mintz and written up in the Journal of Psychology as "Effects of Aesthetic Surroundings." They state:

Aesthetically sensitive individual together with city planners, art educators, and related workers have long been intuitively
aware of the effects of esthetic surroundings. Yet, far as we know, there have been no experimental studies published on the effects of beautiful and ugly environments on people. 66

In summary, the experiment used three rooms classified by the psychologists as "beautiful", "average", and "ugly". The task of the subjects was to rate negative photographs of faces by scales of fatigue/energy and displeasure/well-being. The results were that the "beautiful" room gave significantly higher ratings, the "average" room's ratings were next, and the ratings of the "ugly" room were last. Loosely interpreted, the state of the environment significantly affected overt judgments. 67

Robert Sommer, in his article, "The Significance of Space", attests to the effectiveness of a kind of psychological test, the semantic differential. 68 He determined by this test that students of a college in a rural setting, the University of California at Davis, and the students of a college in an urban setting, the University of Detroit, viewed space much differently, and then determined in what ways they viewed it differently. 69

The bulk of today's environmental research, to reiterate, is occurring at the level of systematic observation. Architects such as Raymond Studer, Sim Van der Ryn, C. M. Deasy, and Ewing Miller have recently used controlled systematic observation to help answer important questions in design problems concerning reaction to spaces or structures.

Robert Sommer has been chief among the psychologists to employ systematic observation, but so have such psychologists as Joachim
Wohlwill, A. E. Paar, Kenneth Craik, David Stea, and Abraham Maslow. In fact, Roger G. Barker and his colleagues of the University of Kansas have recently written a book entitled *Ecological Psychology*, which should give the procedure of systematic observation a new boost as a means of data collecting.

There remains a warning of misuse of method. Maxwell Fry illustrates this in his warning not to use method or technology as a panacea-emphasize the response, not the facts, he declares. In explanation, he refers to the development of the science of acoustics, where technical data are abundant, but little thought has been given towards a response appropriate to the humans that are subjected to such treatment. Rudolf Arnheim states that the type of visual thinking required in systematic observation, "...calls, more broadly, for the ability to see visual shapes as images of the patterns of forces that underlie our existence-the functioning of minds, of bodies and machines, the structure of societies or ideas." This is one instance of possible misuse of the experimental and the alternative procedures, an improper emphasis on factual data. The other potential misuse is in prediction from an observational procedure or an experimental one. In explanation, there are two main types of prediction in any psychology, an actuarial prediction and a clinical one. The actuarial prediction depends heavily on statistical methods and other correlative methods, while the clinical prediction is used by the psychologist interested in problems of personality, and depends on the
rather abstract dimensions of personality and personality traits; it is, therefore, more subject to personal misinterpretation, and probably will not play a significant role in determining day-to-day behavior of groups of persons.

In view of the limitations of the techniques and methodology of psychology and the further limitations of prediction, how is the architect to use these things very broadly?

The answer lies in what these techniques can do for the designer. They can, on an instance-by-instance basis, provide for a guide to the way the human organism will perform and behave, or view his surroundings. They would seem to be able to determine, very accurately, for example, or to predict, the reaction to one specific future space or building, but not to all similar spaces or buildings.

In this light, the methodology could be used either to predict reaction to very crucial environments, or as a continuing source of hypotheses about behavior in other than very specific environments, or to predict reaction to environments new to the architect's experience.

Experimental and alternative techniques seem to afford the architect an opportunity to specify or predict human reaction to environments on an instance-by-instance basis, and afford him hypotheses about broader behavior. Of special significance are the opportunities to be found in the technique of objective systematic observation because of its easy modification for any one desiring to utilize it. The techniques of psychology, with modification, could add to the techniques of archi-
tecture. This relationship is diagramed in figure 6, which illustrates that although the architect cannot directly incorporate psychological methodology as a design too, he could modify it for his own use and for adding to the knowledge that architecture possesses. Finally, if such a design is to be developed, it must have a standard for its language, its tools, its communication, and its means of storing its information.74

How the aggregate knowledge and the methodology of psychology both can be incorporated into design, and in what directions, is covered in the next section of the paper, some implications of theory and methodology for architectural design.
SECTION FOUR. IMPLICATIONS OF THE AGGREGATE KNOWLEDGE AND THE METHODOLOGY FOR DESIGN

In the introduction of this paper the problem was stated as a question that both psychologists and architects have been asking: in what way may perceptual psychology help designers in planning for human behavior? Later, in the two sections of the body of the paper, the aggregate facts and knowledge that psychology has, and the techniques and methods it also has, were examined. From these cursory examinations appeared several summary statements about what information could and could not be used, and why or why not. If one statement were to be made about all of the investigation, it would have to be that the aggregate knowledge cannot much help the designer, but, indirectly, the techniques and methods can. Such a relationship can be graphically depicted, as shown in figure 6.

If the designer is truly interested in rationally affecting human behavior, there are two avenues open to him, and the two are almost diametrically opposed philosophically. First, there is what has been suggested in this entire investigation, that psychology has techniques and methods the architect may elect to alter for his own use, and consequently utilize to determine in what way his designs may affect behavior. The designer may not view his role in this light, and may decide that what he would like to do is to enable his client to more fully participate in the entire design process, from design to
construction, thus avoiding the necessity of elaborate methods of determining how design will affect human behavior. Since both positions have been advanced by leading architects and psychologists, and since both positions see psychology as playing an important but different role, each will be discussed. The purpose, therefore, of this section of the thesis is to synthesize how to use effectively what was analyzed as useful in the second and third sections of the paper.

Of the persons who advocate the first position, Raymond Studer of the Rhode Island School of Design, psychologist David Stea, and Kenneth Craik of the University of California at Berkeley seem the most persuasive. Studer and Stea in a joint article in \textit{Landscape} quote A. E. Paar as saying that elements in the environment should be chosen in response to psychological variables, and instead of designing a building, an effort should be made to program an environment.\textsuperscript{75} Deasy extends the argument to its logical end by stating, "Therefore, the true measure of a building is merit performance as a social (or psychological) setting..."\textsuperscript{76}

Studer reinforces the concept of performance by social setting by defining environment as, "...that which impinges upon any system under analysis,"\textsuperscript{77} and by declaring that the specific objective of environmental design is the optimal accommodation of the biological and non-biological requirements of the participating human organisms through organization of certain relevant variables in the environment.\textsuperscript{78}

This rather elaborate definition of the purpose of design is the recognition of a rather delicate problem of philosophy. Do designers,
through the use of psychology or any other medium, have the right to extensively monitor and manipulate human behavior? Without involving the thesis in such an argument, suffice it to say that the designers and psychologists who are interested in environmental design have very carefully delineated their arguments to avoid such charges. Raymond Studer is repeatedly cited because he has been apparently the first to fully delineate the philosophical ramifications of resolving human environmental behavior for designers. In his useful article, "On Environmental Programming", he concludes that psychology, through its methodology, is capable of describing how the environment can affect the persons who inhabit it. But given that knowledge, he says, the designer now has the unique problem of when, how, and if he should use that power. If human values, current perception of the world, and behavioral systems can be loosely translated by psychological methodology, Studer emphasizes that design goals should then be: a) provide the physical environment that would accommodate these systems, and b) prevent evolution of those environments clearly detrimental to the best interests of society. Perhaps these ideas were best summarized by Studer when he said:

The issue is not whether designers ought to control human behavior (that they do so is an empirical fact), but whether this control is to be exerted via accidental contingencies, or based upon a clear and technical understanding of the human systems to be accommodated.

Their position is not one of manipulation, but of accommodation.

The philosophy outlined, the next commitment is to a methodology
that will accomplish the goal of accommodating behavior. Of available means, the first priority has been given to understanding how the human is affected by the designed environment, precisely what variables are being effectively manipulated, and precisely how these affect participating humans. 82 In simpler terms, what is it designers are changing, and how does this affect the people involved? Once more, Raymond Studer assumes the role of spokesman when he says, "An integrated approach to specifying and accommodating human requirements that can be predicted and explained through an effective and empirically based methodology will not be possible until 'the data are in'." 83

As noted above, those psychologists advocating the use of methodology for solving behavioral problems are very careful to outline their position as accommodative rather than manipulative, and are convinced that the solving of such problems is impossible until such an approach is formulated. Several of these psychologists and architects have gone so far as to propose actual formulations based principally on the findings mentioned in the section of this paper on methodology. One such psychologist is Kenneth Craik, who has gone to such lengths as to improvise an entire methodology. Of it he says:

...it might well become possible to predict at the pre-construction stage both how human observers, and even specific sub-groups of observers, will most likely comprehend the environmental display and how the environmental display will be evaluated in terms of success in fulfilling its function. 84
The ability of environmental psychology to develop predictive power in this area...(can be expected) to place the process of design and planning under rational guidance.  

Craik's methodology is presented as an appendix to the paper.

Psychologist A. E. Paar has repeatedly underscored the importance of a well-defined methodology. "The methods of science," he has said, "have always proved adaptable to the examination of any process that can be brought within the realm of empirical knowledge." Paar suggests that much more extensive use be made of the techniques of simulation and mentions Rice University's Robert Sobel and his work in dynamic simulation by means of television.

This enthusiasm for methodology is by no means limited to psychologists. Architect Sim Van der Ryn in his article, "Problems and Puzzles" feels that the failure of designers to deal with design issues or to create solutions acceptable to society is a failure of method and strategy, and not of good intentions. "Design procedures lacking these steps," he declares, "have too often led architects to become technicians, or puzzle-solvers..."

Ewing Miller, of Ewing Miller and Associates, in an article in the December 1967 issue of Interiors magazine testifies that employing a behavioral methodology in his firm's work on the Indiana State University campus has been extremely beneficial, especially in dormitory design. Miller has established a Department of Behavioral Research and secured the temporary consultant services of Dr. Lawrence Wheeling, Professor of Psychology at California
State College. Miller's methodology has again been simple; he observes and questions the students directly, and translates the findings with the aid of Dr. Wheeler.

On the basis of the discussion on the first approach to the utilization of psychology in design (the techniques approach) it can be fairly stated that a convincing argument has been made for it by its advocates, not only on a theoretical basis, but on a pragmatic, workaday basis. Further, this approach is being successfully implemented in some instances.

However, there has been an increasing interest in the opposite approach - although it is a relatively new thought in almost all quarters. This approach is best expressed by a quotation from the article, "Notes and Comments" from the Winter 1967-1968 issue of Landscape magazine:

A professional elite is to find out what people need and then build it for them. Only a handful of designers seem interested in the opposite approach - that of encouraging people to look at their surroundings themselves, and of giving them the intellectual and physical tools to do their own shaping. 90

At present, this seems more of an idea than a workable hypothesis, and its proponents admit as much in stating that the method would depend largely on education, the results would not be seen for a long time, and it would require designers working not only with scientists, but with school teachers, social workers, and ordinary people. 91 Further, its advocates also hedge on the idea in its purest form, by introducing flexibility as an intermediate surrogate for complete control of the environment by its inhabitants. From "Notes and
Comments" again:

It would not mean abandonment of design work, but rather such work be seen as progress towards other goals. The idea is not to provide the right spaces, for example, but of expanding the spatial experience and range of choice available. 92

Imposing the environment would not be the aim, but encouraging people to manipulate their own environment.

Although there are a number of people proposing this approach, most are silent about the ways of implementing it, and perhaps not so strange is that the advocates of such a policy are for the most part psychologists rather than architects. Among these psychologists is Robert Sommer, author of the book _Personal Space_, who said, "I would predict that the sum total of human satisfaction would be greater when the residents themselves are involved in the design and maintenance of the environment."93 Robert Kates in "The Pursuit of Beauty" adds that if the inhabitants are really to shape the environment, possibly the architects, and thus the psychologists only function is to suggest approaches.94

If the advocates of "inhabitant-shaping" of the environment are critical of others being manipulative, then the advocates of methodology have some strong statements about the feasibility of "inhabitant-shaping" of the environment. Foremost among those critical is Professor Studer who replies, "Verbal reports from inhabitants are conditioned by random and irrelevant events, including those in the existing environment, which is in a state of malfunction."95
In reviewing the position of those who propose that the inhabitants should provide the design and maintenance of their own environment, two facts are evident; that at least two highly reputable psychologists have ventured that the environment would be more satisfactory to those who dwell in it, and that those same residents are today unable, or at least lack the intellectual tools to satisfactorily manipulate their own environment. The most important conception seems to be that ranges of choice and flexibility in design can accomplish effectively the same result by letting residents choose what may best suit their behavioral topographies.

This last statement results in a position of compromise in view of methodology versus inhabitant-shaping. Specifically, if the designer is convinced he must consider human behavior, he may satisfy both positions by using the methods and techniques of psychology to provide for behavioral systems, and simultaneously adding the range of choice and flexibility that would increase his chances of truly satisfying the people who will be affected by his designs.

In fact, such an approach may be implicit in capabilities of the experimental and alternative techniques of psychology. They can, to reiterate, predict macro-behavior of the human, and such behavior can then be designed for. The chances of pre-construction predictive success seem good at this level. As the cognitive psychologists have discovered, however, micro-behavior as the result of mediation by mental facilities as complex as those of the human mind is not adequately understood, possibly will not be, nor perhaps should be.
This, for the architect, is not critical because it is probable that environmental provision for macro-behavioral systems insures the gross success of the environment under analysis. Small-scale behavioral systems are important to the individual person, and consequently to the architect, and can still be accommodated by the design flexibility previously mentioned. A building is successful only if it approximates conditions that allow an inhabitant to express his behavioral systems. If this statement is true, it applies equally to historical and contemporary structures, and it does not matter what the architect's goals are. If he designs for behavior, either overtly or covertly, the design is successful.

Architects since the early sixties and since the advent of behaviorism have mostly subscribed to "behavioral design," and with some initial success, but what comment can be made about the architecture immediately preceding the 1960's, for example? A case in point is the work of Ludwig Mies Van der Rohe. The word "behaviorism" probably cannot be found in writings on him, yet his buildings have paced twentieth century architecture, Phillip Johnson has written, "Mies gives as much thought to placing chairs in a room as other architects do to placing buildings around a square." 96 Paul Heyer in Architects on Architecture states (in describing the Farnsworth House) that if this approach requires a certain austerity and restraint of its occupants, perhaps it is a reasonable price to pay for such dignity. 97

Johnson and Heyer are delineating Mies Van der Rohe's work as
inflexible. The Farnsworth House was one of two early Mies buildings, the other being the proposed Crown Hall, that represent his principle of Universal Space, a concept that should have allowed a great deal of user flexibility. Johnson and Heyer have missed the point by hinting that the space is inflexible.

The purpose of briefly discussing Mies Van der Rohe is to illustrate that conditions that allow expression of behavioral needs are not simple ones. Remember that some psychologists believe that expansion of the spatial experience and range of choice can be a surrogate for flexibility. Certainly this expansion of the spatial experience and range of choice appears very subtly in Mies' designs, even if not explicitly conceived of in that light. The Farnsworth House draws extensively from its natural surroundings, for example, for a spatial experience that is not only different from day to day, but from season to season. The masters of the discipline of architecture seem to intuitively design for human behavioral needs. Hopefully, psychology can partially replace this intuition.

Psychology has the methods and techniques to do this, but most persons involved with behavioral design are uneasy about their direct application. One reason for this is succinctly stated by Victor Gruen:

One of the troubles of our time is specialization, leading to a position in which people working in a special field within the overall environment do not understand each other's language or even try to. 98

Many feel that either these techniques should be altered in order to give the design disciplines their own body of knowledge or that a dialogue
between the overlapping interests of the professions should be estab-
lished. Sim Van der Ryn has stated, "Design requires a language, tools
for communication, and a means to store the information. Little know-
ledge is exchanged between designers in a regular fashion." Reflect-
ing on this, Sommer concludes:

Contributions of social scientists right now are most valuable
in teaching designers how to evaluate existing structures.
Although this provides a good body of case studies, generali-
zation is possible only if there is a great consistency in the
way people react to large elements. Social scientists can be
most useful in evaluating existing structures. A middleman
is urgently needed who is acquainted with the design field as
well as the behavioral sciences. 100

This last statement is extremely perceptive, and introduces a
third possibility, the interdisciplinary professional. Several archi-
tectural offices have hired psychologists directly on their staffs with
varying degrees of disappointment. 101 As an alternative, other offices,
indeed most architects, have tried to carry the burden of social scien-
tist as individuals with equal lack of success. If the profession and
offices are to change, then it seems highly likely that architects will
either drop the behavioral role, and a new breed of specialists and a
new kind if scholastic curriculum will answer the need, or that a suc-
cessful dialogue will be set up between the professions.

The possibilities of a construction of a dialogue between disciplines
and an evolution of the interdisciplinary professional are not mutually
exclusive. The dialogue seems most immediately adaptable in aiding
the architect in translating human behavior into designs that are within
his realm of experience, and whose effects can be intuitively seen. The
psycho-architect as an alternative is especially needed today, as Sommer has pointed out, in new, unique, and critical design situations. There is little doubt of this desperate need in the unprecedented problems of urban design, for instance. As a matter of fact, it may very well be that this field of behavioral design, and the psycho-architecture, or the archi-psychology, whichever it may be, is the one domain of the designer closed to semi-professional interlopers. Market mechanisms, for example, provide the systems firms, notably the metal building trades, with insight into a specific, limited kind of behavior; but answers to the whole spectrum of human behavioral needs are only going to be supplied by persons and disciplines intimately acquainted not only with design, but with the behavioral sciences, and guided by altruistic motives. This should describe the architect.

Obvious also, is the fact that this role will not, in fact cannot, be long in coming. The tragedy is that the human organism is so confoundingly adaptable. "The long-range question," concedes Robert Sommer, "is not so much what sort of environment we want, but what sort of man we want."
FOOTNOTES


8Dember, p. 195.

9Dember, p. 193.

10Dember, p. 233.

11Dember, p. 195.

12Dember, p. 303.

13Dember, p. 305.


17Gibson, p. 29.


27 Neisser, p. 4.


29 Neisser, p. 8.

30 Neisser, p. 8.

31 Neisser, p. 8.

32 Neisser, p. 9.

33 Neisser, p. 9.


35 Neisser, p. 51.

36 Neisser, p. 52.

37 Neisser, p. 75.

Rappoport and Kantor, pp. 211-212.


Sommer, p. 66.


Carol Hans, "C. G. Jung and the Need for Roots," Landscape, XIV, 3 (Spring, 1965), 2.


McGuigan, p. 59.


McGuigan, pp. 65-69.


Craik, p. 31.

McGuigan, p. 60.


57  McGuigan, p. 57.


62  Deasy, p. 55.

63  Deasy, p. 55.

64  Deasy, p. 55.


66  Maslow and Mintz, p. 247.

67  Maslow and Mintz, p. 254.


69  Sommer, pp. 64-65.


72  Fry, p. 319.

73  Rudolf Arnheim, Visual Thinking (Berkley and Los Angelos: University of California Press, 1969),


78 Studer, p. 290.

79 Studer, pp. 290-296.

80 Studer, p. 290.

81 Studer, p. 294.

82 Studer, p. 292.

83 Studer, p. 291.


85 Craik, p. 36.


87 Paar, pp. 15-16.


91 "Notes...," p. 3.
"Notes...," p. 3.


Studer, p. 293.


Heyer, p. 33.


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THREE. Correspondence

Robert L. Bliss, Chairman of the Department of Architecture
Department of Architecture
Building 442 Art Center
Salt Lake City, Utah
84112
re: "National Research Conference on Architectural Psychology"
May, 1966.

Dr. Kenneth H. Craik, Assistant Professor of Psychology
Department of Psychology
3210 Tolman Hall
University of California at Berkley
Berkley, California
94720
Graduate School of Design
Department of Architecture
Harvard University
Cambridge, Massachusetts
02138
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School of Architecture and Planning
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Massachusetts Institute of Technology
Cambridge, Massachusetts
02139
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Sim Van der Ryn, Associate Professor of Architecture
College of Environmental Design
Department of Architecture
232 Wurster Hall
University of California at Berkley
94720
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APPENDIX

Outline for Identification of Behavioral Systems

I. A unit of discourse is set up called the "environmental display" of which there are two dimensions:
   A. Natural
   B. Man-made

II. The problem is defined: to investigate, discover, and define behavioral systems as related to the immediate environment.

III. The elements of the problem are introduced.
   A. Description of the chief observers of the environment to include main types, who inter-relate in varying degrees:
      1. designers
      2. users
   B. Description of how the environment may be experienced.
      1. by direct experience
      2. by simulation
      3. by verbal or other indirect description
   C. Description of the nature and format of any judgments
      1. free descriptions
      2. adjective checklists
      3. activity and mood checklists
      4. Q-sort descriptions
      5. ratings
6. thematic potential analysis
7. symbolic equivalents
8. multi-sensory equivalents
9. empathic interpretations
10. social stereotypic clues
11. beliefs about human consequences
12. viewing time
13. motational systems

D. Description of all validational criteria
1. measurement of objective characteristics of the environment
2. judgments by experts
3. any judgment form listed in item c based on a more extensive acquaintance with the environment

IV. The direction of research is determined and research proceeds with:
A. A presentation of the environment
B. Studies of the observers with emphasis on group differences in the comprehension of reality
C. Organization of response formats
D. Assessments and appraisals of the environment by:
   1. team description
   2. team evaluation: those environments deemed successful before criterion indices
E. Preconstruction predictive assessments of any future environment by:

1. reference to a fund of systematic empirical knowledge concerning stable relationships between objective descriptive characteristics of the environment and evaluative criterion indices.

2. improved ability to derive direct descriptive assessments from indirect presentations.