
Kenneth Albert Beattie
University of Massachusetts Amherst

Follow this and additional works at: http://scholarworks.umass.edu/dissertations_1

Recommended Citation
http://scholarworks.umass.edu/dissertations_1/2760

This Open Access Dissertation is brought to you for free and open access by ScholarWorks@UMass Amherst. It has been accepted for inclusion in Doctoral Dissertations 1896 - February 2014 by an authorized administrator of ScholarWorks@UMass Amherst. For more information, please contact scholarworks@library.umass.edu.
RECEPTIVITY-ADAPTABILITY: A DYNAMIC MODEL OF INFORMATION RECEPTIVITY IN PROBLEM SOLVING

A Dissertation Presented

By

Kenneth Albert Beattie

Submitted to the Graduate School of the University of Massachusetts in partial fulfillment of the requirements for the degree of

Doctor of Education

May, 1974

Education
ACKNOWLEDGEMENTS

To Jeff Eiseman I wish to express my sincere appreciation for his guidance and many hours of assistance. His thoroughness, careful problem solving, and integrated concern with theoretical and practical issues in education have, and will continue to, influence me greatly.

I thank Dwight Allen for being an invaluable and irreplaceable source of excitement and stimulation. The experiences I have had as a result of my association with him have been a crucial part of my education.

Alice Eagly was of great help in the empirical portion of this study as were several members of the University of Massachusetts Computer Center staff. Lou Fischer has served me as a model for clear thinking and has often been the impetus for me to broaden my perspective on educational issues.

My thanks also to Barbara Scheller for her many hours of conscientious work in typing this manuscript.

And finally, my deepest thanks to Betsy, my wife for the thousands of things she did in conjunction with this dissertation, but most of all for her having just the right amount of patience.
ABSTRACT

RECEPTIVITY-ADAPTABILITY: A DYNAMIC MODEL OF INFORMATION RECEPTIVITY IN PROBLEM SOLVING

By

Kenneth A. Beattie, B.A., M.Ed., Stanford University

Chairman: Jeffrey W. Eiseman

The concept of an individual adapting his receptivity to information to problem-solving circumstances is introduced and labelled receptivity-adaptability (R-A). In providing a conceptual framework to explain the dynamics underlying receptivity-adaptability, a literature review begins with the works of Adorno, et al. (1950) on the Authoritarian Personality and Rokeach (1960) on the Open and Closed Mind and then proceeds to a discussion of the nature of a basic antinomy between openness to information calling for a change in one's perceptions of the environment and a desire to preserve already existing views and attitudes of the environment. Several theories supporting the functionality of the "open" and "closed" sides of the antinomy are reviewed in this discussion.

The concept of a cognitive structure as the means by which an individual organizes his perceptions of the environment is then developed and the characteristics of this structure as viewed by Ausubel, Bruner, Harvey, et al., Schroder, et al., Piaget, Rokeach, and Berlyne are compared. Three characteristics
of cognitive structures are distilled from this review: comprehensiveness, differentiation, and integration. The concept of an individual's receptivity-adaptability (R-A) profile is developed in more detail. First, patterns of receptivity to information are described in terms of (1) scope of receptivity and (2) category accessibility rules. Second, problem situations are described in terms of (1) factors contributing to the potential arousal level of an individual and (2) factors contributing to the information input complexity of the situation. The relationships between these problem situation characteristics and the three characteristics of cognitive structure are examined in a conceptual discussion which provides a framework for explaining the dynamics underlying individual differences in R-A profiles.

An empirical study conducted to investigate the hypotheses that (1) individuals change their patterns of receptivity as problem situations change and (2) that receptivity-adaptability is related to intolerance of ambiguity and to cognitive complexity is then described and its results presented.

The dissertation concludes with a discussion of the educational and research implications of the conceptual framework and the empirical study.
A GRADUATE STUDENT'S SOLILOQUY

To imply or to infer, that is the confusion. Whether 'tis nobler to be illuminating in one's thoughts as is the sunshine of day, or to be confounding in one's mental tribulations as is the valley fog of early morn'.

Me thinks it presumptuous, if not sumptuously presumptuous, that me thinks me thinks aught of value or intellectual coinage for the practical mind of the impractical man. Me thinks, you thinks, they thinks. 'Tis doubtless more a fool's folly than ice cream, you scream, we all scream for I scream.

But anon! A chapter awaits. This hand, this mind, pax vobiscum, this curmudgeonly soul must needs be productively engaged forthwith lest my marriage and my life's degree be left forthwithout. But, alas, poor Yorick! Poor Dum Dum!

_Humblet, III, iv, 116-133_
# CONTENTS

ACKNOWLEDGEMENTS ................................................................. ii

A GRADUATE STUDENT'S SOLiloQUy ........................................ iii

LIST OF TABLES ................................................................. v

LIST OF FIGURES ............................................................... vi

CHAPTER I. INTRODUCTION ...................................................... 1

CHAPTER II. A REVIEW OF EARLIER WORK IN RECEPtiVITY TO INFORMATION ......................................................... 12

CHAPTER III. COGNITIVE STRUCTURE AND THE CONCEPT OF A RECEPtiVITY-ADAPtABILITY PROFILE ........................................... 47

CHAPTER IV. THE CONCEPTUAL FRAMEWORK ................................ 88

CHAPTER V. HYPOTHESES, METHODOLOGY, AND RESULTS ............. 178

CHAPTER VI. IMPLICATIONS FOR RESEARCH AND PRACTICE .......... 209

APPENDIX ................................................................. 231

BIBLIOGRAPHY ............................................................... 247
### LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1 Major Hypotheses Regarding Receptivity-Adaptability</td>
<td>181</td>
</tr>
<tr>
<td>5.2 Subsidiary Hypotheses Related to Receptivity-Adaptability</td>
<td>183</td>
</tr>
<tr>
<td>5.3 The Experimental Design</td>
<td>188</td>
</tr>
<tr>
<td>5.4 Results of Analysis of Variance with Intolerance of Ambiguity as the Between-Subjects Variable</td>
<td>194</td>
</tr>
<tr>
<td>5.5 Cell Means for the Problem-Scope and Time/Money Available Variable</td>
<td>195</td>
</tr>
<tr>
<td>5.6 Differences Between Treatment Means with Significance Determined by Tukey HSD Method of Multiple Comparisons</td>
<td>196</td>
</tr>
<tr>
<td>5.7 Results of Analysis of Variance with Cognitive Complexity as the Between-Subjects Variable</td>
<td>201</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>18</td>
</tr>
<tr>
<td>2.2</td>
<td>24</td>
</tr>
<tr>
<td>2.3</td>
<td>32</td>
</tr>
<tr>
<td>3.1</td>
<td>58</td>
</tr>
<tr>
<td>3.2</td>
<td>63</td>
</tr>
<tr>
<td>3.3</td>
<td>68</td>
</tr>
<tr>
<td>3.4</td>
<td>71</td>
</tr>
<tr>
<td>4.1</td>
<td>174</td>
</tr>
<tr>
<td>5.8</td>
<td>205</td>
</tr>
</tbody>
</table>
CHAPTER I
INTRODUCTION

Perhaps man should heed the plight of the mosquito. Few, if any, of Man's adversaries have been as successful as the mosquito in overcoming the situational obstacles placed in the course of his existence as pest and sometime deadly enemy to Man. Despite the ingenuity of Man's methods of eradicating the mosquito, it always has survived - survived by adapting to the new circumstances. Man also has had an enviable record for overcoming the obstacles he has faced in his short history. He, like the mosquito, has owed his success to his adaptability.

The mosquito's adaptability is an outgrowth of the rapidity with which the process of random mutation supplies the species with resistance to the new pesticide or other change that has been introduced into his environment. Man owes his adaptability to different species characteristics. His adaptability has been an outgrowth of his ability to manipulate factors in his environment, or this solution failing, to change his behavior patterns voluntarily to fit the situation in which he has found himself.

Standard Oil of New Jersey (whose way of adapting to environmental changes has been to change its name to Exxon) believes it has finally come up with an obstacle to place in
the mosquito's environment to which the mosquito will not be able to adapt. Many writers on ecology, technology, and sociology believe man may have also come up with obstacles to which he himself will not be able to adapt. Man's earlier (and present) failures to appreciate and respect the complicated network of ecological interrelationships of which he is a part threatens his existence on one side. His ever-increasing dependence on a technology that threatens to become too specialized and elaborate for him to control presses on him from another side. And the intricacies of his social relationships produce larger and larger problems that threaten to destroy his species from within. There is no easy way to characterize the nature of all the obstacles, but there is a characteristic common to the all: complexity. Through the process of adapting his environment to his immediate needs, Man has triggered such rapid and complex change in his environment that the key to his surviving these problems is an ability to adapt even more rapidly and on a more massive scale.

It is at this point that the potential role of education becomes crucial. I believe that a major function of education should be to aid society to adapt to changing circumstances (Many aspects and implications of this belief are delineated in Eiseman, 1969). Given the context of Man's existence described above, this function could most appropriately be carried out by preparing individuals to be effective problem-solvers in a highly complex world. A great deal of
the effort of some educators has been devoted to this goal, but a flaw in their effort has been their failure to deal with that aspect of problem solving which concerns the appropriateness of an individual's receptivity to available information. That this is a crucial aspect of problem solving becomes apparent as we examine the present context of Man's existence.

This context is made up of two related components. The first of these is the socio-historic context. Briefly, it is characterized by five general tendencies I believe are present or evolving in men's relations with other men and with other elements of their environment. The five are:

1. Movement toward ever-increasing specialization of function resulting in greater and greater interdependence among men, and a concomitant increase in the complexity of social events.

2. Partly as a consequence of the above tendency, an increase in the number of serious conflict situations faced by men—conflict situations which frequently have at their heart attitudinal or ideological components.

3. As the problems faced by men become more technical, an increase in the degree to which generalists in decision-making roles must rely on the advice given them by specialists who, because of their widely separated areas of expertise and differing perspectives on the given problem, may make recommendations which conflict.

4. An increase in mass participation in decision-making due partially to the growth of mass communications technology and partially to the character of the dominant political philosophies of the present.

5. An increase in the rate of social, technological and environmental change necessitating ever more rapid adaptation of men's behaviors to compensate for the changes.
Problems that arise in the context of these socio-historic tendencies are likely to put a premium on the exchange of information between people. This rise in dependence on social sources of information creates two difficulties for the problem-solver involving his receptivity to information. First, the use of other people as sources of information often complicates a problem-solving situation by introducing a concern with information about the social sources themselves in addition to his concern with the problem-relevant information they offer. Should the problem-solver be equally or differentially receptive to information from different social sources? In making this decision, to what sorts of information about the sources should he be receptive (i.e., allow to influence him)?

The other difficulty accompanying dependence on social sources or information is the ease with which the amount of relevant and irrelevant information can increase to a point that surpasses the information-processing capacities of the problem-solver. Can he avoid an information overload by closing out, or ignoring irrelevant or less important information and attending only to relevant or crucial information?

Unfortunately, a partial answer to these questions comes from a second component of the context of human activity. This second component involves the susceptibility of most individuals to several behavioral propensities I believe influence their receptivity to information. These behavioral propensities include:
1. Resistance to changes requiring new behavior patterns and low receptivity to information urging or supporting such changes.

2. Low receptivity to information from other persons having attitudes, beliefs, and behavior patterns differing significantly from their own.

3. A capacity for disregarding and/or misperceiving available and potentially valuable information, especially that which counters currently held beliefs, attitudes and expectations.

4. Difficulty focusing upon relevant information available from the total conglomerate of relevant and irrelevant information present in the problem-solving situation.

5. Difficulty ignoring relevant but less crucial information when exigencies of the situation demand focusing upon a narrow range of information.

When these human propensities regarding receptivity to information are combined with the socio-historic conditions outlined earlier, they greatly exacerbate the difficulties encountered by Man as he attempts to solve the complex problems he faces in adapting to his changing environment. For on the one hand, he must avoid being too closed: he must be receptive to information that contradicts his previously held views or that comes from unexpected sources; he must be able to evaluate the information and its source on their separate merits and be only minimally biased by his own values; he must be able to ferret out important information hidden among hosts of irrelevancies or recognize it even when it is distorted by the heat of emotion; and he must be able to foresee the long-
term consequences that may be wrought by the complex interactions of present events. Yet on the other hand, he must avoid being too open; he must be able to close out the cacophony of irrelevant information that can so easily overwhelm his limited information processing capacities; and when the situation requires it, he must ignore the relevant-but-not crucial information and focus only upon crucial information.

To cope with both sets of needs, I believe men must attempt to match their receptivity to information to the characteristics of the problem-solving situations they encounter. Some individuals achieve more successful matches than others. It is this unequal distribution of the ability to adapt one's receptivity to information to the characteristics of the problem-solving situation that leads me to look for the factors that influence the growth of this ability in an individual. My hope is that some of the factors are susceptible to manipulation by educators. If this can be demonstrated, schools may someday be able to improve a person's ability to adapt his receptivity to information to the characteristics of the situations he faces and thereby increase his problem-solving ability.

It should be apparent that an individual's having an appropriate degree of receptivity to available information is but one aspect of successful problem solving. Problem solving in its broadest sense has been the concern of enlightened educators at least since the early writings of John Dewey. Occupying such a position of central concern for such a long
period it has not failed to attract its share of talented scientists to probe the intricacies of its functioning. Among others, Piaget (Flavel, 1963), Bruner (Bruner, Olver, Greenfield, et al., 1966) and Ausubel (Ausubel, 1963, 1969, Anderson and Ausubel, 1965) have studied it from the perspective of the cognitivist while Skinner (Skinner, 1957), Berlyne (Berlyne, 1965), and Maltzman (e.g., in Anderson and Ausubel, 1965) have looked at it through the eyes of the learning theorist.

As indicated above, my specific concern is with an individual's receptivity to information, that is, with the factors that influence the match between his receptivity and the characteristics of the problem-solving contexts in which he functions and this aspect requires attention to more than the intelligent, rational functioning of an individual. It also requires attention to the role of factors in the affective realm -- attitudes, values, and commitments, anxieties, and emotions. These aspects of human behavior also have been a major concern of social scientists and educators for a long time and have drawn their share of investigators, primarily social psychologists. The experiments and writings of Festinger (1952), Heider (1946), Osgood and Tannenbaum (1957), Rosenberg (1956, 1960, 1965), and others just begin the list of those who have been concerned with the role of attitudes, values, etc. on perception, memory, learning, and other aspects of
problem-solving behavior. The work of these social psychologists and the psychologists concerned more directly with cognitive functioning furnishes a solid base to build upon; and it is by drawing together some of the theories and findings of these two groups of psychologists that I hope to develop a theoretical framework for investigating the factors influencing a person's ability to adapt his receptivity to situational characteristics.

The study outlined in Chapter V of this proposal is intended to examine a few of the most basic assumptions underlying this theoretical framework and to give some indication of the heuristic utility of the concept of an individual's receptivity-adaptability (R-A) profile.

In characterizing the concept of an R-A profile it is necessary to relate two sets of factors: (1) the nature of the individual's receptivity to information in a given problem-solving situation and (2) the nature of the receptivity called for by the characteristics of the problem-solving situation itself. I begin here by discussing the former of the two aspects of the R-A profile.

One can imagine a receptivity to information dimension running from low to high. A person high on this dimension would be highly receptive to any information available, whether it was in the form of written arguments for different sides of a salient issue, irrelevant comments overheard from a nearby conversation, or subtle changes in the background
noises present in the setting in which he finds himself. By contrast, a person low on this dimension would be essentially unreceptive to available information as a result of either actively avoiding or just not perceiving information that pertained to the conditions and problems surrounding him. An example of the latter case might be a secretary deep in reveries about last night's date. Somewhere between very high receptivity and very low receptivity would be the cases of the moderately receptive person who is actively seeking information about all aspects of a salient issue regardless of the viewpoint but at the same time completely unaware of other events taking place around him, and the moderately unreceptive person who is quite receptive to information about new aspects of a salient issue only as long as this new information does not contradict his presently held attitudes concerning the issue.

In addition to its being possible to characterize an individual's receptivity to information along a low-to-high dimension, it is also possible to characterize a situation as calling for a particular receptivity somewhere along the low-to-high dimension. One situation may require a person to be very receptive while another situation may require this same individual to be relatively unreceptive. For example, prior to making a major foreign policy decision regarding the distribution of foreign aid the situation calls for a high degree of receptivity to information ranging all the way from the
likely short-term reaction of the domestic electorate, through the impact of the aid program on the stability of a number of crucial international alliances, to the long-term impact of possible cultural and societal changes that might result from alterations in the economic structure of recipient nations. On the other hand, faced with a sudden crisis calling for immediate action, it would be highly disfunctional for a leader to consider too wide a range of alternative solutions, thereby diminishing the amount of attention he could devote to any one. Such a situation calls for only moderate receptivity to available information. Furthermore, having made a decision regarding a course of action, a very low receptivity may become most appropriate. By ignoring all information regarding what might have been done, and even information regarding the quality and wisdom of the decision made, all of the individual's energy and attention can be devoted to seeing that everything possible is done to carry out the elected course of action successfully. Overconcern with, or high receptivity to, information regarding the advantages of a foregone course of action often reduces the likelihood of success of the chosen course by causing vacillation and equivocation.

Assuming the possibility of placing both individuals and problem-solving situations along the dimension of low-to-high receptivity, it then becomes feasible to characterize individual's abilities to adapt their receptivity to the re-
requirements of the situation. The strategy becomes one of placing an individual in a number of problem-solving situations requiring different degrees of receptivity and determining the extent to which his own receptivity matches that required by the characteristics of the various problem-solving situations. The hypothetical construct used to describe the extent of this match I have designated the receptivity-adaptability profile. The word profile is used to indicate that receptivity-adaptability is probably a multi-dimensional trait even though in this first chapter it has been treated as a uni-dimensional trait.

This point and others regarding the hypothetical nature of receptivity-adaptability and its underlying dynamics will be discussed in Chapter IV when a conceptual framework is developed and presented. In Chapter V, a modest empirical study undertaken to test a few of the basic hypotheses included in the conceptual framework will be described and its results discussed. The implications the conceptual framework and the empirical study might have for future research and for educational practice are set forth in Chapter VI. But between us and the conceptual framework lies the material contained in Chapters II and III. This material includes a review of work by others, which comprises the base upon which the conceptual framework is built, and a more extensive description of the concept of a receptivity-adaptability profile. It is to this material that we turn now.
CHAPTER II

A REVIEW OF EARLIER WORK IN RECEPTIVITY TO INFORMATION

The purpose of Chapter II is to review briefly the work of several social scientists that have influenced the thinking presented in the Chapters III and IV. In these two chapters a conceptual framework for identifying individual differences that determine to what extent individuals will have the ability labelled in the last chapter receptivity-adaptability is developed. As mentioned in the first chapter, this conceptual framework will be built in large measure upon the combined works of several social psychologists who might be characterized as "consistency theorists" and several developmental psychologists who might be characterized as "cognitive theorists." However, the works of two groups of psychologists who fit neither of these categories constitute the initial parts of the base underlying the conceptual framework, and they will be discussed first. These two groups of psychologists were those led by T. W. Adorno and Milton Rokeach. Though at first glance, the works of Adorno et al. (1950) and Rokeach et al. (1960) do not seem concerned with studying receptivity-adaptability, aspects of both studies have an important bearing upon the investigation of this ability.
Early Work Bearing on Receptivity-Adaptability: A Review of Adorno and Rokeach

In their well-known work, *The Authoritarian Personality*, Adorno and his co-workers were concerned with studying the nature of prejudice and its relationship to the political ideology of the prejudiced individual. Very early in the course of their study, they discovered that prejudice seemed to be a general trait rather than a specific and isolated behavior. By this, it is meant that a person prejudiced against one minority group, e.g., Jews, was also very likely to exhibit prejudice toward members of any other minority groups he might encounter, e.g., Chinese. Indeed, Levinson argued that the prejudiced, or highly ethnocentric, person tends always to view the social world in terms of an out-group--ingroup situation in which the outgroup is viewed as less moral, weaker, and generally inferior to the ingroup of which he is a member (Adorno, 1950, pp. 145-150).

A second finding reported by Adorno, *et al.* concerns the apparent relationship between ethnocentricity and political ideology. Specifically, Adorno's group believed that the very prejudiced person was also likely to be a very politically conservative person - a fascist, in the terminology used in Adorno's *Authoritarian Personality*. (Adorno, 1950, p. 279, pp. 264-267) Although not specifically stated in their work, much of the discussion pertaining to political ideology, and indeed, the title of the work itself, make it clear that Adorno *et al.* regarded the prejudiced person's attitude
toward authority to be a crucial trait in the personality syndrome of the prejudiced individual. Again and again the authors stress the dependence of the prejudiced person on authority, his belief in unquestioned obedience to authority, and the right of the superior ingroup to exercise authority over the weaker, inferior outgroups.

The importance of Adorno's work for an investigation of receptivity-adaptability becomes more clear when the two phenomena discussed by Adorno, prejudice and authoritarianism, are presented in terms of patterns of receptivity to information. Viewed in these terms, a major aspect of prejudice can be regarded as being the selective rejection of information about certain groups of people when the information contradicts the stereotype the prejudiced individual attaches to that group. The other side of this phenomenon is that the prejudiced person will have a high receptivity to information that supports his stereotypes. Again when viewed in terms of patterns of receptivity, an important aspect of prejudice is that a prejudiced individual is likely to have very low receptivity to information from persons he regards as being members of outgroups, e.g., a prejudiced person who is Caucasian and lives in a predominantly white country is not likely to be as receptive to information from Filippinos or others he regards as members of inferior minority groups as he is to information from members of his own race. Likewise, Adorno's authoritarian personality, when described from the perspective
of patterns of receptivity to information, becomes an individual who is very receptive to information from social sources occupying positions of authority and quite unreceptive to information which goes counter to the view prescribed by authority. Adorno et al. thus found that the "authoritarian personality" tended to adopt patterns of receptivity which were characterized by evaluation of information on the basis of its valence (i.e., receptive to pro-attitudinal information, unreceptive to counter-attitudinal information) and on the basis of its source (i.e., receptive to information from ingroup sources, unreceptive to information from outgroup sources). This recasting of Adorno's findings into terms relating to receptivity to information helps highlight the fact that his work is some of the earliest which investigates, if only in a limited way, factors which influence the degree to which individuals have the ability we have labelled receptivity-adaptability.

The approach taken by Adorno and his co-workers was to search for underlying personality characteristics that were influencing particular aspects of an individual's behavior. Having identified these personality characteristics, e.g. repression, a power orientation, rigidity, etc., the investigation was extended to include a search for the roots of these personality characteristics in the individual's early family experiences, especially his relationship with early authority figures such as father and mother (Adorno, 1950, pp. 473-488).
It is their investigation of the early environmental conditions to which individuals are exposed and the relationship between these and an individual's development which have the greatest import for our understanding the training conditions which will result in individuals having differing degrees of receptivity-adaptability.

The approach taken by Milton Rokeach and his co-workers departs in an important way from the emphasis placed on the role of personality by Adorno et al. in their analysis of prejudice and authoritarian ideology. Rokeach and his fellow researchers believed that ideological extremism and attitudes toward authority, as well as many aspects of cognitive behavior, aesthetic preferences, and even personality traits themselves, had at their source still more basic individual characteristics. In the words of Rokeach, he had set out "to find a single set of concepts, a single language, that is equally appropriate to the analysis of personality, ideology, and cognitive behavior" (Rokeach, 1960, p. 7). Rokeach contended that such a set of concepts would have to be concerned with the structure, rather than the content of individuals' beliefs and behaviors. The set of concepts Rokeach et al. developed in The Open and Closed Mind for analyzing personality, ideology, and cognitive behavior deal specifically with the structure of an individual's belief-disbelief system. Because this set of concepts provided the jumping-off-point for many of the ideas set forth in the conceptual framework
presented in Chapter IV, they deserve some discussion here.

According to Rokeach, the individual's belief-disbelief system includes beliefs concerned with religion, politics, science, philosophy, aesthetics, etc., and in fact, includes:

...every belief and disbelief of every sort the person may have built up about the physical and social universe he lives in. ...we mean it to represent each man's total framework for understanding his universe as best he can. (Rokeach, 1960, p. 35)

Rokeach uses the term "belief-disbelief system" to highlight the point that we must investigate the values and attitudes rejected by the individual as well as those he holds. Furthermore, Rokeach is concerned that a person's disbelief system not be regarded simply as the mirror image of his belief system. He argues that:

...every [belief-disbelief] system is asymmetrical; it includes on the one hand a system of beliefs that one accepts, and on the other, a series of systems that one rejects.

...The belief system is conceived to represent all the beliefs, sets, expectancies, or hypotheses, conscious and unconscious, that a person at a given time accepts as true of the world he lives in. The disbelief system is composed of a series of subsystems rather than merely a single one, and contains all the disbeliefs, sets, expectancies, conscious and unconscious, that, to one degree or another, a person at a given time rejects as false. (Rokeach, 1960, pp. 32-33)

An illustration of Rokeach's point might be the case of a Catholic who accepts the system of religious beliefs set
down in Church dogma but rejects, to varying degrees, a whole series of other religious belief systems including Protestantism, Islam, Hinduism, Zoroastrianism, Agnosticism, and Atheism.

In discussing the organization of belief-disbelief systems, Rokeach identifies three characteristics or dimensions of the system's structure. The first of these is a similarity-of-beliefs dimension. Rokeach hypothesizes that the individual rejects each of the systems making up his disbelief system to the extent that its content is similar to, or different from, his own belief system. Accordingly, if a schematic drawing could be made of an individual's belief-disbelief system, it would show his own belief system at one end of a dimension and the most different belief system of which the individual is aware at the other end. At intervals between these two belief systems, others of which the individual is aware would be placed in order of their similarities to his belief system. The extent to which the individual rejected a given system would be indicated by its distance from his own belief system along the dimension (See Figure 2.1).

Similarity-Dissimilarity Dimension

<table>
<thead>
<tr>
<th>Protestantism</th>
<th>Hinduism</th>
<th>Agnosticism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catholicism</td>
<td>Islam</td>
<td>Zoroastrianism</td>
</tr>
</tbody>
</table>

FIGURE 2.1
Rokeach also assumes that the organization of an individual's belief-disbelief system along the similarity-dissimilarity dimension will be influenced by three properties of the system. As summarized by Rokeach these properties are:

1. **ISOLATION** of beliefs or subsystems of beliefs as evidenced by (a) the coexistence of logically inconsistent beliefs within a belief system; (b) the accentuation of differences and minimization of similarities between belief and disbelief systems; and (c) the denial of existing contradictions within a system.

2. **DIFFERENTIATION** of belief subsystems as evidenced by (a) relative amount of knowledge possessed pertaining to a particular belief or belief system and (b) the perception of similarity between adjacent subsystems.

3. **COMPREHENSIVENESS or NARROWNESS** of the system as evidenced by the total number or range of disbelief subsystems represented within a given belief-disbelief system (Rokeach, 1960, pp. 35-39).

The second major dimension of belief-disbelief system organization is the central-peripheral dimension. Rokeach subdivides this dimension into three regions. The Central Region is composed of "primitive" or "pre-ideological" beliefs which include beliefs about the ultimate nature of things, e.g. the nature of physical reality, the nature of the social world such as the extent to which it is basically hostile or friendly, the nature of one's individual existence such as one's orientation in physical space, autonomy, etc. These central or primitive beliefs are those which a person assumes are held by everyone, those which are regarded as so
basically obvious to everyone that they are not susceptible to disconfirmation by any authority. The second of the three regions, the Intermediate Region, contains an individual's beliefs regarding the extent to which he should be guided by authority. These intermediate beliefs concern such issues as whether or not there is such a thing as absolute authority (human or supernatural), whether pronouncements by authority must be accepted totally or if they should be tempered by an individual's own rational reflections, etc. The third of the three regions, the Peripheral Region, contains all the individual's remaining beliefs about specific aspects of the world—whether he has acquired these by his own experience or from sources he regards as valid authorities. The issues covered by peripheral beliefs would range all the way from how one views government regulation of industry to whether one believes the Yankee teams of the 1930s were better than the Dodger teams of the 1950s.

The third major dimension of belief-disbelief systems identified by Rokeach is a time perspective dimension which ranges from broad to narrow. A broad time-perspective is one in which the past, present, and future are all represented in the belief system. A narrow time-perspective is one in which beliefs are concentrated in either past, present, or future. The belief systems of many religious sects and utopian political movements are examples of narrow time-perspectives in that they are often concentrated on recreating
a "golden age" of the past or a "perfect world" in the future. A narrow time-perspective can also be concentrated in the present, as in the case of an individual who "lives only for the present" and has no significant beliefs concerning either the past or the future.

The three dimensions of belief-disbelief systems just discussed - the similarity-dissimilarity dimension, the central-peripheral dimension, and the narrow-broad time-perspective dimension - are the basic structural elements which Rokeach believed underlay an effective analysis of individuals' personalities, ideologies, cognitive behavior, etc. In contrast to Adorno, Rokeach rejected the idea that a useful way of categorizing people was according to the content of their beliefs, e.g., on the basis of whether or not they favored authoritarian forms of government and social organization. Rokeach felt that a more profound way of categorizing individuals was according to the structure of their belief-disbelief systems in terms of the three major dimensions he had identified. Categorization based upon a structural analysis, allowed Rokeach to group together individuals with very different beliefs on the basis of behavior patterns they had in common. For example, some extreme political conservatives and some extreme political radicals are very similar with respect to certain patterns of behavior they exhibit despite great differences in the content of their ideological beliefs. On the other hand, this structural analysis also allowed Rokeach to make
important distinctions between members of the same group, e.g., communists, on the basis of fundamental differences in their behavior patterns despite their holding common ideological beliefs (Rokeach, 1960, pp. 109-131). The crucial factor in predicting an individual's behavior, argued Rokeach, was whether or not that person had an open or closed mind — a condition Rokeach contended would determine whether an individual rejected others because they had beliefs that differed from his own and accepted all those who had similar beliefs, or whether an individual accepted others who held beliefs that contradicted his own beliefs.

By casting Rokeach's work in terms of receptivity to information, we can see more clearly the relevance of Rokeach's ideas and findings to our concern with receptivity-adaptability. From this perspective, his studies can be regarded as an investigation of the effects of the structural characteristics of an individual's belief-disbelief system on his dependence upon the similarity of an information source to his own beliefs in determining whether to accept or reject information from that source. Given certain structural characteristics, an individual's belief-disbelief structure should influence him to be open-minded and receptive to information regardless of its valence (i.e., pro-attitudinal vs. counter-attitudinal) and its source (i.e., those espousing dissimilar beliefs as well as those espousing similar beliefs). Given a different set of structural characteristics, an individual's
belief-disbelief system should influence him to be closed-minded and receptive only to information consistent with his own beliefs or coming from sources which espouse the same important beliefs as he does. These are, of course, only two polar-types of belief-disbelief system structures which represent the opposite poles of a continuous dimension. The characteristics which determine the extent to which a belief-disbelief system will lead an individual to be open-minded or closed-minded are summarized by Rokeach in Figure 2.2 which is taken from The Open and Closed Mind (Rokeach, 1960, pp. 55-56). Note that Rokeach violates his own rule that it is structure rather than content which should be analyzed by including in his discussion of the central-peripheral continuum a concern with content as a crucial variable.

In justifying the characterizations given in Figure 2.2, Rokeach argues that the essence of the distinction between the open and the closed mind is the inability of the closed-minded individual to "discriminate substantive information from information about the source, and to assess the two separately" (Rokeach, 1960, p. 60). This leads to the closed-minded person's evaluating others on the basis of the similarity of their beliefs to his own and also to his accepting or rejecting information on the basis of whether or not the source has the same value, or belief bias as he does. Rokeach then draws from this and other assumptions what he regards as the logical implications for the nature of open and closed belief systems.
FIGURE 2.2
A Belief-Disbelief System Is

<table>
<thead>
<tr>
<th>Open</th>
<th>Closed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. to the extent that, with respect to its organization along the belief-disbelief continuum,</td>
<td>1. the magnitude of rejection of disbelief subsystems is relatively high at each point along the disbelief continuum;</td>
</tr>
<tr>
<td>1. the magnitude of rejection of disbelief subsystems is relatively low at each point along the continuum;</td>
<td>1. the magnitude of rejection of disbelief subsystems is relatively high at each point along the disbelief continuum;</td>
</tr>
<tr>
<td>2. there is communication of parts within and between belief and disbelief systems;</td>
<td>2. there is isolation of parts within and between belief and disbelief systems;</td>
</tr>
<tr>
<td>3. there is relatively little discrepancy in the degree of differentiation between belief and disbelief systems;</td>
<td>3. there is relatively great discrepancy in the degree of differentiation between belief and disbelief systems;</td>
</tr>
<tr>
<td>4. there is a relatively high differentiation within the disbelief system;</td>
<td>4. there is relatively little differentiation within the disbelief system;</td>
</tr>
</tbody>
</table>

B. to the extent that, with respect to the organization along the central-peripheral dimension, |

| 1. the specific content of primitive beliefs (central region) is to the effect that the world one lives in, or the situation one is in at a particular moment, is a friendly one; | 1. the specific content of primitive beliefs (central region) is to the effect that the world one lives in, or the situation one is in at a particular moment, is a threatening one; |
| 2. the formal content of beliefs about authority and about people who hold to systems of authority (intermediate region) is to the effect that authority is not absolute and that people are not to be evaluated (if they are to be evaluated at all) according to their agreement or disagreement with such authority; | 2. the formal content of beliefs about authority and about people who hold to systems of authority (intermediate region) is to the effect that authority is absolute and that people are to be accepted and rejected according to their agreement or disagreement with such authority; |
| 3. the structure of beliefs | 3. the structure of beliefs and... |
FIGURE 2.2 (Continued)

and disbeliefs perceived to emanate from authority (peripheral region) is such that its substructures are in relative communication with each other, and finally;

disbeliefs perceived to emanate from authority (peripheral region) is such that its substructures are in relative isolation with each other, and finally;

C. to the extent that, with respect to the time-perspective dimension, there is a

1. relatively broad time-perspective.  
1. relatively narrow, future-oriented time perspective.

The arguments offered by Rokeach in making these inferences are not entirely satisfactory (see Rokeach, 1960, pp. 60-70). However, in the course of presenting the arguments, Rokeach does make a point that is crucial to the development of our conceptual framework. This point is that the function of belief-disbelief systems is a dual one. In the words of Rokeach:

...all belief-disbelief systems serve two powerful and conflicting sets of motives at the same time: the need for a cognitive framework to know and to understand and the need to ward off threatening aspects of reality. To the extent that the cognitive need to know is predominant and the need to ward off threat absent, open systems should result. In the service of the cognitive need to know, external pressures and irrational internal drives will often be pushed aside, so that information received from outside will be discriminated, assessed, and acted on according to the objective requirements of the situation. But as the need to ward off threat becomes stronger, the cognitive need to know should become weaker, resulting in more closed belief systems. Under threat, information and source should become inseparable and should be evaluated arbitrarily in line with the rewards and punishments meted out by authority.
(Rokeach, 1960, pp. 67-68). (Underlining mine.)

We find in this statement by Rokeach our first mention of what we have called receptivity-adaptability. According to Rokeach, a person remains receptive to information (has an open mind) when the need to understand the world is predominant, but as soon as information coming from the outside world causes the individual to experience a maximum level of threat, he adopts a pattern of receptivity (closed mind) which leaves him receptive only to information which helps decrease the feelings of being threatened. With this, Rokeach has taken us several steps further than Adorno et al. He has highlighted the importance of examining behavior patterns for an underlying structure that explains behavior in a number of seemingly disparate realms. He has raised to a more explicit level the notion that the manner in which a person accepts and rejects information is crucial to understanding many aspects of behavior. And, most important, he has suggested that the function to be played by whatever structure it is that determines whether an individual has an "open mind" or a "closed mind" is a dual one which sometimes emphasizes his need to know and understand reality and at other times emphasizes his need to be protected from threatening aspects of reality.

But Rokeach has not taken us far enough. If the basic functions of a belief-disbelief structure are: (1) to help us satisfy the need to know and understand the world and (2) to
help us ward off threatening aspects of this world, what in turn are the sources of these two needs? Why is it need-fulfilling or functional for an individual to understand reality, or, on the other hand, why is it need-fulfilling or functional not to understand reality? An attempt to give full answers to these questions must wait until Chapter IV, but the work of some of the social psychologists mentioned in the first chapter brings us nearer to an understanding of why it may be functional for an individual to adopt either of the two opposite orientations toward information from the environment.

A Social Psychology Perspective: The Basic Antimony

An appropriate starting point for reviewing the work of the psychologists we have labelled "consistency theorists" is a discussion of the Jones and Gerard concept of the basic antinomy (Jones and Gerard, 1967, pp. 227-240). They introduced the concept of a basic antinomy between "openness to change and the desire to preserve a pre-existing view or conviction" to explain much of the research data on the impact of value and attitude on perceiving and remembering. They hypothesize that one principle of human behavior is that an individual will tend on the one hand to be open to, seek, perceive, and respond to information which conflicts with their present beliefs and expectations regarding aspects of the environment and on the other hand to be closed to, avoid,
distort, and ignore such information. The tendency toward openness presumably favors changes in the behavior and beliefs of the person while the opposite tendency toward being closed presumably favors the preservation of present behavior patterns and beliefs.

A basic assumption underlying the reasoning presented in Chapter IV is that the existence of this basic antinomy can be attributed to its functional utility in Man's evolutionary history. Though it may usually be treated as a psychological phenomenon, it is the adaptive role it has played in the biological survival of Man that may explain its existence.\(^1\) It may have evolved in much the same way that Konrad Lorenz has argued that aggression and several mechanisms to curb aggression came to be a part of Man's behavior (Lorenz, pp. 54-83). Despite its largely speculative nature, it is worth noting that the existence of the basic antinomy as a basic principle of human behavior is probably justified by its function as an aid to Man's survival.

To examine the manner in which this basic antinomy is functional, it may be helpful to look separately at the advantages of each of the opposing sides of the antinomy for an individual. First, let us look at the case for the closed

\(^1\)A good description of the notion that biological adaptation consists of an organism's approximating his actual response to the "optimal response" and the implications of this for the organism's gathering and rejecting information is given by Berlyne in his *Structure and Direction in Thinking*, 1965, pp. 34-48.
side of the antinomy, that is the evidence that a pattern of receptivity which allows an individual to perceive consistency and stability in the environment is advantageous to him. The most basic advantage to an individual of being able to close out information from the environment is that it allows him to give selective attention to certain aspects of his environment. The huge mass of potentially available information in the form of sensory input cannot possibly be processed simultaneously by a person's limited cognitive abilities. He therefore finds it to his advantage to "pay attention to" only those aspects of the environment which in the past have proven important to him.

A related, but somewhat more sophisticated, advantage attributable to the closed side of the antinomy results from the necessity of being able to predict events which will take place in the environment. This allows an individual to adjust his behavior so that it will be appropriate to forthcoming events. In order for a person to anticipate events successfully, the environment must appear relatively stable and predictable to him. If he takes note of every change in the environment, no matter how insignificant or irrelevant to his present purpose, an individual will be much less likely to note the over-all consistency and stability of the environment. It is the closed side of the basic antinomy - the human tendency to ignore, distort, or simply not perceive information in the environment - that allows an individual to
perceive the environment as relatively stable and predictable and helps an individual take note of the general laws governing the occurrence of events in the universe.

Another functional advantage of the closed side of the basic antinomy is discussed by Jones and Gerard (Jones and Gerard, 1967, pp. 180-184). They argue that it helps the individual move toward an "unequivocal behavior orientation (UBO)" which allows the individual "to act without the disruptive influence of holding conflicting views regarding what actions he should take." Their assumption is that an action taken by a resolute person is more effective than the action taken by a person who is vacillating between a number of choices. By becoming less receptive to information regarding unchosen alternatives, the individual will become more and more unequivocal about following the course of action he has elected.

A last argument for the functionality of an individual's receptivity being governed by the closed side of the antinomy comes from the role habituation plays in human behavior. It is through habituation that humans are allowed to follow a sort of "least effort principle." After repeated exposures to similar stimulus characteristics in the environment, or after repeated enactments of the same behavior sequence, an individual is able to perform a seemingly automatic behavior sequence in these oft-repeated situations. Under such circumstances, a conscious level of involvement in the selec-
tion of relevant elements of information or appropriate actions is no longer necessary. If the essential aspects of the situation remain unchanged and the originally acquired habits remain appropriate ones, this habituation can result in more efficient behavior than that based on conscious decision-making. Performance in an assembly line or carrying out a much practiced procedure such as a lunar landing are examples of such situations.

A good deal of indirect empirical and theoretical support for the existence of the closed side of the basic antinomy has been produced by the social psychologists concerned with demonstrating the influence of a human preference for consistency. The commonality shared by all these theories is the basic assumption that humans have a need to view themselves and the world as maintaining an over-all consistency. Because each of the major theorists differs somewhat from the others in terms of how consistency is defined, it is worthwhile to discuss briefly three of the major consistency theories. Robert Zajonc (1968) has reviewed each extensively in his chapter in the Second Edition of The Handbook of Social Psychology and I have borrowed heavily from his discussion.

Perhaps the earliest of the consistency theories is the balance theory of Fritz Heider (1946, 1958). Heider's theory stresses the importance of structurally balanced relationships in dyads and triads. He begins with the assumption that when a set of relations, e.g., between three people or between a
person and an action or object, is perceived by an individual as composing a unit, that unit will be either in a balanced (steady) state or in a state of imbalance (disequilibrium). The state of a unit is determined by the "dynamic character" of its parts, i.e., whether each is perceived as positive or negative. For example, a dyad consisting of persons A and B will be balanced from A's standpoint if he perceives himself to like B and perceives B as liking him in return. Cartwright and Harary (1956) converted Heider's theory into the language of graph theory and used signed graphs to depict balanced and unbalanced states. The example of a balanced unit given above would be depicted as: \[ A \sim B \]; while an imbalanced unit, e.g., A liking B but perceiving that B dislikes A, would appear as: \[ A \sim B \]. In a similar fashion triads can also be either balanced or unbalanced as shown in Figure 2.3.

![Balanced Unbalanced Balanced Unbalanced](image)

FIGURE 2.3

Heider's theory postulates that units in disequilibrium will tend to move toward balanced relationships or the units themselves will break-up. However, these forces toward symmetry or balance in unit relations is not presumed to be a powerful driving force, only a tendency.
In reviewing the empirical literature applying to balance theory as formulated by Heider and extended and formalized by Cartwright and Harary (1956) and Abelson and Rosenberg (1958), Zajonc raises an important question regarding this research. Though evidence exists which strongly suggests a human preference for balanced states, Zajonc questions whether these results are due to the "good figure forces"\(^2\) of balance theory or due to the effects of attraction or preference for agreement. He believes the latter is the most important factor in many of the studies and regrets that these studies fail to separate the effects of these different factors.\(^3\)

Osgood and Tannenbaum (1955) attempt to avoid the problems caused by the effects and interactions due to attraction and agreement by limiting their concern specifically to the relations between: the attitude of a person toward a

\(^2\)The term "good figure forces" derives from the basic contention of Gestalt psychology that humans have a strong perceptual tendency to "complete" fragmented stimulus objects or regularize irregular stimulus patterns in such a way as to result in the individual's perceiving a "good figure." The assumption Heider seems to have made is that balanced states constitute "good figures" and imbalanced states "bad figures" with the consequence that an individual will tend to want to bring about a balanced unit relationship whenever possible.

\(^3\)Theodore Newcomb's theory of balance (Newcomb, 1953) does deal directly with the role of agreement as a factor determining the extent to which a social relationship is in a balanced state. Because agreement in Newcomb's theory is conceived of as a social force toward consistency rather than as a cognitive force toward consistency, it is less germane to the conceptual framework presented in Chapter IV and, therefore, is not discussed here.
source (s); the person's attitude toward a concept (c); and an assertion made by the source about the concept. The basic hypothesis of the theory outlined by Osgood and Tannenbaum is the congruity principle--namely that attitude change will take place in the direction of bringing into congruence an individual's attitudes toward a source, a concept, and the attitude expressed by the source in assertions made about the concept.

In empirical tests of the Osgood and Tannenbaum hypothesis, the subject rates the source (s) and the concept (c) on the semantic differential scales developed by Osgood and then is presented with the assertion (positive or negative) made by the source about the concept. Predictions are then made from a mathematical model about the amount and direction of the subjects changes in attitude toward the concept. The model includes two weighting factors: (1) + A, the assertion constant intended to balance the stronger effect an assertion will have on the attitude toward a concept than it will have on the attitude toward the source and (2) i, the incredulity factor which is intended to balance the effect of the subject's disbelieving that a source makes the alleged assertion. The congruity principle predicts that the subject will use one of four strategies to achieve congruity and still maintain his attitudes unchanged. These four strategies are:

1. weakening the association between the source and concept;
2. invalidating the assertion by bringing to bear information which contradicts it;
3. strengthening his attitude towards the concept by seeking supportive information and beliefs; and
4. changing his attitude toward the source.

If these four strategies fail the individual, he must achieve congruity by changing his attitude toward the concept.

Empirical tests of the congruity principle have generally ordered the data but failed to give satisfactory numerical fits between the quantitative predictions of amounts of attitude change and the actual amounts of attitude change obtained in the results.

Less formal, but also less limited in application, is Festinger's theory of cognitive dissonance (1957). According to the theory, cognitions that bear a relevant relation to each other can either be consonant or dissonant, i.e. either consistent or inconsistent with one another. In Festinger's words:

Two elements are in dissonant relation if considering these two alone, the obverse of one element would follow from the other. To state it a bit more formally, x and y are dissonant if not-x follows from y. (Festinger, 1957, p. 13)

Presumably, humans have two tendencies that determine the dynamics of dissonance: (1) a propensity on the part of an individual to bring his cognitions into congruence with perceived reality and (2) a drive to maintain consistency
among the cognitions themselves. Dissonance can arise because of a number of occurrences including informational inconsistency, disconfirmed expectations, insufficient justifications for actions taken, and post-decision regret. As for the theory itself, Zajonc summarizes the major elements by listing nine propositions:

1. Cognitive dissonance is a noxious state.

2. In the case of cognitive dissonance the individual attempts to reduce or eliminate it and he acts so as to avoid events that will increase it.

3. In the case of consonance the individual acts so as to avoid dissonance-producing events.

4. The severity or the intensity of cognitive dissonance varies with (a) the importance of the cognitions involved (b) the relative number of cognitions standing in dissonant relation to one another.

5. The strength of the tendencies enumerated in (2) and (3) is a direct function of the severity of dissonance.

6. Cognitive dissonance can be reduced or eliminated only by (a) adding new cognitions or (b) changing existing ones.

7. Adding new cognitions reduces dissonance if (a) the new cognitions add weight to one side and thus decrease the proportion of cognitive elements which are dissonant, or (b) the new cognitions change the importance of the cognitive elements that are in dissonant relation with one another.

8. Changing existing cognitions reduces dissonance if (a) their new content makes them less contradictory with others, or (b) their importance is reduced.
9. If new cognitions cannot be added or the existing ones changed by means of a passive process, behaviors which have cognitive consequences favoring consonance will be recruited. Seeking new information is an example of such behavior.

For our purposes it is important to note that the propositions numbered 6, 7, 8, and 9 concern the means by which cognitive consistency may be conserved and are similar to the second and third strategy alternatives available for maintaining attitudinal consistency mentioned by Osgood and Tannenbaum in discussing their congruity principle (see p. 34). These propositions are the elements of greatest concern to us in the consistency theories because they deal directly with the role played by information in reducing the tension developed by imbalance, inconsistency, or dissonance. In effect, these propositions support the notion that by becoming receptive only to information which helps achieve or maintain cognitive consistency, the individual can escape from the anxiety or tension these theories hypothesize accompanies cognitive inconsistency.

Although a majority of the studies prompted by Festinger's theory of cognitive dissonance deal with attitudinal change as a means of dissonance reduction, one class of studies has been concerned more directly with receptivity to information. These studies attempt to investigate the effects of dissonance on selective exposure to information. The hypothesis in these experiments is that an individual will avoid or reduce
dissonance by attempting to expose himself only to information which supports positions to which he has already committed himself. In his review of the studies on selective exposure to information, Zajonc (1968, pp. 382-386) calls attention to the equivocal nature of the results. He attributes this to experimental design difficulties which confound other factors with dissonance and which are plagued by failures to create sufficiently strong dissonance in the subjects. A second failing of these studies which is more important from the perspective of our concern with receptivity to information is that they concern themselves only with whether the individual exposes himself to supportive or to discrepant information and not with how the individual actually deals with the information to which he exposes himself. With regard to this point, Festinger argues that a person with knowledge that discrepant information does exist may experience dissonance until given the opportunity to seek out that discrepant information with the intention of discovering and rebutting the fallacious arguments it contains.

Not mentioned by Zajonc or Festinger but important to the understanding of the results obtained in the selective exposure experiments is the possibility that the individual either perceives the discrepant information in such a biased and distorted manner that it does not constitute a discrepancy for him or that he reacts to the information by rejecting its validity on the basis of its coming from what he regards
as a biased source. Whatever the case, dissonance theory and some of its supporting studies do highlight the tendency for individuals to maintain a consistent outlook on the phenomena composing their environments by remaining closed to, or unreceptive to, information which threatens their maintaining a consistent world view. In effect, all of the consistency theories imply that inconsistency can be one of the 'threatening aspects of reality' Rokeach believes a closed belief-disbelief system protects the individual from.

The support of the functional role of the closed side of the basic antinomy does not rest solely on the arguments and studies produced by the consistency theorists. Jones and Gerard (1967, pp. 227-255) cite an impressive list of studies dealing with perception, learning, and information retention that also support the functionality of the closed side of the basic antinomy. Because our interest lies more in the area of the influence of cognitive consistency and inconsistency on receptivity to information, these other studies will not be discussed here.

All of the consistency theories have in common a tension-reduction view of human motivation. They assume that a basic force in man and other organisms is the desire to escape tension, reduce drive, or avoid arousal. Somewhat in opposition to the tension-reduction theory of human motivation is the contention by White (1959), Berlyne (1960) and others that man and higher organisms have a tendency to seek out
novelty in the environment, to be challenged by changing circumstances, and to welcome arousal. This second view of human behavior reflects the functioning of the open side of the basic antinomy and is consistent with the other function of belief-disbelief systems - that of providing a "cognitive framework to know and understand" the environment - identified by Rokeach. Now that we have reviewed the support for the functionality of the closed side of the basic antinomy, it is necessary to review the support for the existence of the other side of the antinomy - the open side - and of the advantages to an individual of being open to information which conflicts with his current view of the environment.

From a logical point of view the functionality of the open side of the antinomy derives from man's information-dependence on his environment. If an individual is to adjust his actions appropriately to the changes taking place around him, he must constantly be open to information that signals the coming or arrival of changes. As long as the environment is stable or consistent, prediction of events, and consequently decision-making and action, tend to be less dependent upon the gathering of information from the environment. As the environment becomes increasingly unpredictable, an individual has to grasp the significance of new events and is consequently more dependent upon accurately perceiving and processing information from the environment.

In addition to this logical argument, there exists both
theoretical and empirical support for the functional advantages of the open side of the basic antinomy. R.W. White (1959) has reviewed a large number of studies done with higher vertebrates and humans and has concluded that some explanation other than drive reduction is necessary to explain such behaviors as:

...visual exploration, grasping, crawling and walking, attention and perception, language and thinking, exploring novel objects and places, manipulating the surroundings, and producing effective changes in the environment. The [Mr. White's] thesis is then proposed that all of these behaviors have a common biological significance: they all form part of the process whereby the animal or child learns to interact effectively with his environment...Such activities in the ultimate purpose of competence must therefore be conceived to be motivated in their own right. It is proposed to designate this motivation by the term effectance, and to characterize the experience produced as a feeling of efficacy (White, 1959, p. 329).

Thus, a feeling of efficacy, due in large part it will be argued in Chapter IV to the ability of an individual to predict the consequences of his interactions with the environment, is the ultimate motivation for the individual to let his behavior and his receptivity to information be guided by the open side of the basic antinomy.

Berlyne (1960) in discussing the motivations for what he terms epistemic behavior or "behavior that augments knowledge" (1960, p. 262) rejects as insufficient the theories based on extrinsic motivation, i.e., theories which argue
that all behavior is motivated by seeking external rewards which lead to drive reduction. His reason for rejecting these theories is their inability to explain idle curiosity or behavior which Berlyne calls

...epistemic searches concerned with matters that are perplexing but trivial from a practical point of view. (Berlyne, 1960, p. 278)

Berlyne also rejects these theories as insufficient because they do not explain how an individual is motivated to go through the chain of intervening symbolic responses, or mental steps, involved in deductive problem-solving of the sort typified in moving from the statement of an assumption to the proof of a theorem. Only the final step of the proof, that is, the symbolic statement which begins with the word "therefore..." is capable of reducing the drive to achieve solution of the proof. And yet, as Berlyne points out, the person is capable of making this supposedly drive-reducing symbolic response at anytime and without having performed the intervening steps in the proof.

As an alternative to the extrinsic motivation theories, Berlyne proposes that there is an intrinsic motivation to seek information and that this drive is a consequence of conceptual conflict. He likens it to the Gestalt position that man seeks to fill the gaps in incomplete configurations and to Dewey's contention that "the object of thinking is to introduce a congruity between ...conditions at hand and
a desired and intended result, between an end and the means for reaching it" (Dewey, 1910). Despite his opposition to the drive-reduction theories, Berlyne recognizes that his own theory of conceptual conflict is a highly modified version of drive reduction (1960, p. viii). The essential difference is that he rejects the idea that the so-called "basic drives" are the source of the motivation to think, and he substitutes instead the idea that the most important motivation for epistemic behavior is the conflict which occurs when a stimulus situation is such that several, incompatible symbolic responses could be made by the individual but there are no cues which clearly favor the enactment of any one of the responses over any of the others. An individual trying to choose which of four liberal democrats to support in the presidential primary elections is an example of a situation in which several incompatible responses are elicited by the stimulus situation and could lead to conceptual conflict, and hence, to epistemic behavior. Though based largely upon extrapolation from general principles of behavior theory, Berlyne also cites a number of diverse studies which give strong, if not direct, support for his contentions.4

Berlyne's work has important implications for the conceptualization presented in Chapter IV and will be discussed

---

4For a detailed review of these studies see D.E. Berlyne, Conflict, Arousal, and Curiosity, 1960, pp. 261-275.
again there; but for the moment it is necessary to limit ourselves to mentioning those aspects of his work which relate to the functioning of the open side of the basic antinomy. This latter portion of his work can be summarized by noting that Berlyne's review of work done on orienting responses, investigatory responses, and arousal supplies considerable evidence that both humans and higher animals assume states of high receptivity to information and even seek arousal from exposure to stimulus situations containing excitatory levels of complexity, uncertainty, or incongruity.

In reviewing the evidence that a basic antinomy between openness to incongruent or discrepant information on the one hand and closedness toward such information on the other hand exists as a basic, and functional component of human behavior, we have attempted to make a strong case for Rokeach's observation that some internal structure (Rokeach believes it to be a belief-disbelief system) performs two important but opposing functions: (1) to furnish the individual with a cognitive framework to help him know and understand reality, and (2) to provide him with a protective screen to help him ward off threatening aspects of reality. We have shown that both of these functions can be advantageous and that they seem to form an important part of typical human behavior patterns. But we have not found a sufficient explanation of the dynamics underlying the operation of this basic antinomy.
In discussing this, Jones and Gerard (1967, pp. 227-229) speak in terms of the dominance of one side or another of the basic antinomy as being dependent upon the phase of behavior in which a person finds himself. In the pre-decisional phase of behavior, when attempting to determine what course of action is most desirable, the open side of the antinomy is dominant. In the post-decisional phase of behavior, when the action is being, or has been taken, the closed side of the antinomy is dominant. Where no action is perceived to be possible - that is, when the individual does not believe his behavior can significantly change the course of events - the closed side of the antinomy is again dominant. For Jones and Gerard these are functional determinants of which side of the antinomy will be dominant. They lead the person to be "better prepared to approach attractive stimuli," perceptually defend against uncongenial events when action is not possible, or be hypervigilant to negative stimuli when preventative action is possible (Jones and Gerard, 1967, p. 225).

The argument by Jones and Gerard that the dominance of either side of the basic antinomy is determined by whether a person is in the pre- or post-decisional phase of behavior and whether or not action on his part is possible does explain why one or another side of the antinomy should be dominant. But it does not explain why in reality the balance between the two sides of the antinomy may function in an inappropriate manner causing a person to be open when
he should be closed and vice-versa. This explanation gives us no insight into why there should be the individual differences in receptivity to information that so concerned Rokeach. Nor does it give us a means of characterizing these individual differences.

This is partially due to the fact that Jones' and Gerard's conception of open-closed as a single dimension indicating the degree to which an individual is receptive to counter-attitudinal and incongruent information does not take into account other characteristics of the individual, of the information, or of the problem situation than whether or not action can be taken by the individual. In Chapters III and IV we will introduce some of these other factors which may be determinants of whether or not an individual's patterns of receptivity to information are striking an appropriate balance between the two sides of the basic antinomy.
CHAPTER III
COGNITIVE STRUCTURE AND THE CONCEPT OF A RECEPTIVITY-ADAPTABILITY PROFILE

At the close of Chapter II it was noted that Jones's and Gerard's explanation of the dynamics underlying the functioning of the basic antinomy was insufficient partly because it did not take into consideration important characteristics of individuals which might influence the functioning of the basic antinomy and partly because it did not take into consideration important characteristics of the environmental situation which might also influence the functioning of the basic antinomy. To rectify this shortcoming, we will (1) discuss the nature of cognitive structures and the important characteristics of their organization which may influence the functioning of the basic antinomy and (2) discuss the notion of a receptivity-adaptability (R-A) profile as a useful expansion of the basic antinomy notion of Jones and Gerard and the open-closed mind notion of Rokeach.

Characteristics of Cognitive Structure

One useful way of conceptualizing the manner in which a mature human organizes and reacts to the diverse stimuli of his environment is by postulating the existence of a cognitive structure in all individuals. This cognitive structure
has been variously described by a number of cognitive theorists including Ausubel (1963), Bruner (1956, 1966), Harvey, Hunt, and Schroder (1961), Piaget (1950, 1952), Schroder, Driver, and Streufert (1967), and Berlyne (1965).\textsuperscript{1} All of these theorists, with the exception of Berlyne, have in common the assumption that the cognitive structure is the organizational pattern through which are filtered, or into which are fitted stimuli from the individual's environment. The structure is regarded as a sort of cognitive representation of the environment. Baldwin (1969, p.333), in discussing the nature of this cognitive representation, suggests that it is a coding of the information in the environment, and he goes on to stress that the cognitive representation "must be a coding that indicates the structure of the environment, i.e., the relationships among items as well as the items themselves ..." and is not limited to information currently present, but also includes information available in the individual's memory. Thus, the cognitive structure is not only a representation of the environment, but also is a structure that the individual "projects onto the environment" thereby highlighting the relationships among the elements composing the environment.

\textsuperscript{1}Berlyne's position differs significantly from the others mentioned here because he is essentially an S-R theorist. His concept of the cognitive structure is discussed in Chapter IV.
Bruner's model of cognitive development (Bruner, 1966, p.319) assumes that the individual's "knowledge of the world is based on a constructed model of reality, a model that can only partially and intermittently be tested against input," and that, Bruner, contends, can represent reality in any of three modes: (1) action (enactive mode); (2) imagery (ikonie mode); and (3) symbolism (symbolic mode) (1966, pp.1-67). In mature members of western societies the symbolic mode usually supercedes the other two. According to Bruner (1966, p.47) the minimum properties of such symbolic representations must include categoriality, hierarchy, prediction, causation, and modification because "any symbolic activity ... is logically and empirically unthinkable without these properties." Presumably then, Bruner's model of the cognitive structure is a set of categories organized in a hierarchical fashion and having the functions of enabling the individual to predict events in his environment, infer causation in these events, and cognize actions to modify them. Bruner (1957) has also argued that each of the categories in such a cognitive structure is characterized at any point in time by having some particular degree of "category accessibility" which governs the ease with which an individual will perceive and process different stimuli into the various categories he has in his cognitive structure.

In Ausubel's view, the cognitive structure is composed of a hierarchy of "traces" of past experience including some
"highly inclusive conceptual traces under which are subsumed traces of less inclusive subconcepts as well as traces of specific informational data" (Ausubel, 1963, p. 24). According to Ausubel, structures typified by this "progressive differentiation" correspond most closely to the "postulated way in which ...knowledge is represented, organized, and stored in the human nervous system" (1963, p. 79).

More fully developed than Bruner's and Ausubel's characterization of cognitive structure, but very similar to them, is that of Harvey, Hunt, and Schroder (1961). They conceive of the structure as a system of concepts and give the following explanation:

A concept in the most general sense is a schema for evaluating impinging stimulus objects or events. Abstracted from the experience of objects in the environing world, it represents a category of varying definitiveness and breadth along some specifiable dimension (hot-cold, good-bad, and so forth) (Harvey and Rutherford, 1958). Once a concept has evolved, it serves as a psychological yardstick in terms of which stimuli are compared and guaged, a kind of experiential filter through which objects are screened and evaluated on their way from sensory reception to ultimate response evocation.

Concepts, in their matrix of interrelatedness, serve the critical cognitive function of providing a system of ordering by means of which the environment is broken down and organized, is differentiated and integrated, into its many psychologically relevant facets. In this capacity, they provide the medium through which the individual establishes and maintains ties with the surrounding world. It is on the basis of the web of these conceptual ties that one is able to place oneself stably and meaningfully in relation to time, space, and other dimensions of his psychological universe.
It is on this basis, hence, that one's self-identity and existence are articulated and maintained. Threat to such ties or severance of them leads to a psychological mobilization aimed at maintaining or restoring them, efforts, which if unsuccessful may result in a major reorientation and organization of ties to the world, or more drastically, even to breakdown or destruction of the self. (1961, p. 11)

We have in this statement something very close to the idea expressed by Rokeach concerning the dual functions of a belief-disbelief system (see page 25) except that the structure under discussion is a conceptual system or cognitive structure.

Piaget's conception of the cognitive functioning of the mature individual is also based on the assumption that structural elements allow the individual to organize and understand his environment. In Piaget's theory\(^2\) (Piaget, 1950) the basic element of structure is the scheme or schema (the term being translated each way by different translators). The schema is a pattern the individual uses for interacting with the objects and events in the environment, or in the vocabulary of Piaget, for assimilating the environment. For Piaget, who was educated as a biologist, the schema is the psychological analog of biological structures, e.g. the digestive system. Just as the digestive system is a structure whose function is

\(^2\)In addition to the primary sources cited, much of the discussion of Piaget's theories is based upon A. L. Baldwin's chapters on Piaget in his Theories of Child Development, 1967, pp. 171-300.
to enable the organism to assimilate food, so Piaget conceives of schemata as structures enabling the individual to assimilate elements of his environment. Piaget discusses two kinds of schemata: (1) sensory-motor schemata which are overt patterns of behavior performed as a reaction to stimuli in the environment, e.g., reacting to the stimulus of a baby rattle by reaching for and grasping it; and (2) conceptual schemata which consist of cognitive operations such as classifying or determining relationships between stimuli perceived in the environment or retained as memories of past interactions with the environment. It is this latter kind of schema with which we are most concerned since it is the structure most akin to what we have labelled cognitive structures. Piaget's conceptual schema can be regarded as the elements of which a cognitive structure is composed and are thus roughly equivalent to Bruner's categories, Ausubel's traces, and the concepts of Harvey, Hunt, and Schroder.

Because the cognitive structure, as described by the theorists discussed above, is the major component of an individual's information-processing mechanism, it is reasonable to assume that the patterns of receptivity to information exhibited by an individual will be reflections of his cognitive structure. Marked individual differences in patterns of receptivity displayed by two individuals probably have as their source important differences in the characteristics of the two individuals' cognitive structures. This is a view very
similar to Rokeach's structural theory as presented in Chapter II, except that the structure postulated here is a cognitive structure rather than a belief-disbelief structure.

This hypothesized influence of cognitive structure characteristics on receptivity to information is based on the same assumptions that are made by the "cognitivists" about the functioning of cognitive structures. One such assumption is that information perceived in the environment is in some way categorized as it is taken into the cognitive structure. A given stimulus object is likely to have a number of different attributes any one of which, or combination of which, determines the manner in which it is fitted into the cognitive structure. A green rubber ball, for example, has attributes which include size, color, weight, hardness, smell, taste, resiliency, density, suitability for playing jacks, suitability for playing handball, suitability for use in a one-way valve, etc. Which of these attributes are noted by an individual is likely to depend on the categories or concepts the individual's cognitive structure contains, as well as upon current situational demands.

Another assumption underlying the concept of cognitive structure that has implications for the relationship between cognitive structures and receptivity is the notion that the cognitive structure does more than represent the elements in the environment. It also serves to highlight the relationships between these elements, to reflect the structure of
the environment itself. The nature of these relationships extends beyond the temporal and spacial relationships that our senses relay to us. There are also intricate cause-and-effect relationships which cannot be perceived without the individual's having a means of representing these relationships. Thus, a person whose cognitive structure reflects the interdependence between heat and the expansion of materials is likely to be receptive to a different set of hypotheses regarding the behavior of a bi-metallic bar than a person whose cognitive structure reflects only the interdependence of heat and the melting or burning of materials.

Furthermore, the cognitive structure is likely to influence the patterns of receptivity an individual adopts for one other reason. The information available in the environment at any particular time is only a portion of the information at the individual's disposal for understanding that particular situation. An individual's cognitive structure represents a storehouse of information which may be brought to mind by characteristics of the environment at a given time. Missing or obscured elements of information may be added to the situation from the individual's cognitive structure and, therefore, differences in the dimensions defining the various categories in an individual's cognitive structure are likely to influence his ability to supply the appropriate bits of information to a given solution.
In addition to characterizing in one manner or another the nature of cognitive structures in general, each of the cognitive theorists mentioned above supplies some hints regarding what characteristics of cognitive structures might contribute to individual differences in receptivity to information. According to Harvey, Hunt and Schroder (1961) the crucial variable of cognitive structure contributing to individual differences is the degree of concreteness-abstractness of the concepts making up an individual's cognitive structure. In contrast to Ausubel's emphasis on the hierarchical nature of cognitive organization, Harvey, Hunt, and Schroder hypothesize that conceptual concreteness-abstractness is reflected in four organizational characteristics of conceptual systems, namely:

1. The clarity-ambiguity dimension which refers to "the distinctness with which the component aspects of the system ... are differentiated or articulated;"

2. compartmentalization-interrelatedness which refers to "the extent to which concepts within a system are interconnected" or isolated from one another;

3. centrality-peripherality which refers to "the degree of essentialness of a concept to the larger constellation of concepts;" and

4. openness-closedness which refers to "the receptivity of the system to external events or to varied interpretations of the situation" and which Harvey, Hunt, and Schroder hypothesized might be a function of centrality-peripherality. (1961, pp. 75-76)
It is worth noting the similarity of these dimensions of cognitive structure to the dimensions of belief-disbelief structure identified by Rokeach. In both cases differentiation (termed clarity-ambiguity by Harvey et al.) and integration (termed compartmentalization-interrelatedness by Harvey et al. and isolation by Rokeach) are identified as crucial dimensions. Both theories also consider centrality-peripherality an important dimension, but the definitions of this dimension given by Rokeach and Harvey, Hunt, and Schroder differ significantly from one another. It was noted in the discussion of Rokeach's theory in Chapter II (see page 23) that he violated his own structural approach in defining the centrality-peripherality dimension. The definition given by Harvey, Hunt, and Schroder is much less extensive but also violates the consistency maintained in their definitions of the other dimensions of cognitive structure. The others are all defined as structural characteristics, but centrality-peripherality is defined as a characteristic of the units making up the structure. Thus it is possible to speak in terms of the differentiation (i.e., clarity-ambiguity), integration (compartmentalization-interrelatedness), or receptivity (openness-closedness) of a cognitive structure, but it is inappropriate to speak in terms of the centrality or peripherality of a cognitive structure.

In a later work written with Driver and Streufert (Schroder, Driver, and Streufert, 1967), Schroder abandoned
the notion of centrality-peripherality as a dimension of cognitive structure and chose to define the levels of information processing attainable by a conceptual structure as being a function of three dimensions:

1. differentiation, or the number of unique dimensions used by an individual to arrange the perceived information;

2. discrimination, or the capacity of the structure to distinguish between different stimuli or elements of information along a single dimension; and

3. integrative complexity, or the number of different ways in which "dimensional units of information can be interrelated in different ways in order to generate new and discrepant perspectives about stimuli." (1967, pp. 14-28)

There is apparently room for confusion and disagreement concerning the identification of those dimensions of cognitive structure which are the sources of individual differences in receptivity to information. Figure 3.1 presents a comparison of the dimensions identified by Rokeach et al. (1960), Harvey, Hunt, and Schroder (1967), and Schroder, Driver, and Streufert (1967) as well as the dimensions or characteristics of cognitive structure used in the development of the conceptual framework presented in Chapter IV. The centrality-peripherality dimensions identified by Rokeach and by Harvey, Hunt, and Schroder are not used in the conceptual framework for the reasons discussed above regarding the inconsistency of the definition of that dimension with a structural approach
CHARACTERISTICS OF COGNITIVE STRUCTURES

<table>
<thead>
<tr>
<th>Rokeach</th>
<th>Harvey, Hunt, and Schroder</th>
<th>Schroder, Driver, and Streufert</th>
<th>Conceptual Framework Presented in Chapter IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>comprehensiveness</td>
<td>---</td>
<td>---</td>
<td>comprehensiveness</td>
</tr>
<tr>
<td>differentiation</td>
<td>clarity-ambiguity</td>
<td>differentiation</td>
<td>differentiation</td>
</tr>
<tr>
<td>isolation</td>
<td>interrelatedness-compartmentalization</td>
<td>integration</td>
<td>integration</td>
</tr>
<tr>
<td>central-peripheral</td>
<td>centrality-peripherality</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>time-perspective</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

A comparison of the major characteristics of cognitive structure organization identified by Rokeach (1960), Harvey, Hunt, and Schroder (1961), Schroder, Driver, and Streufert (1967), and those used in the conceptual framework presented in Chapter IV.

FIGURE 3.1
to the problem. As a characteristic of categories making up a cognitive structure, centrality-peripherality is discussed in Chapter IV. Rokeach's time-perspective dimension is also rejected as being essentially a concern with the content, (and therefore subsumable under the comprehensiveness dimension) rather than the organization of cognitive structures and of little importance to the development of the conceptual framework dealing with receptivity-adaptability. The openness-closedness dimension identified by Harvey, Hunt and Schroder is rejected because this characteristic of cognitive structures, it is hypothesized in our conceptual framework, is likely to be determined by the other dimensions of the structure. Finally, the two dimensions which Schroder, Driver and Streufert identify as discrimination and differentiation are combined into a single dimension in the conceptual framework of Chapter IV. In their definitions of these two dimensions, differentiation and discrimination, Schroder, Driver and Streufert attempt to make a distinction between what in common usage are synonymous terms. Differentiation they use to indicate the number of dimensions available in a cognitive structure for evaluating a given set of information. They use discrimination to indicate the fineness of the gradations available on a given dimension in a cognitive structure for evaluating a given set of information. We have combined these two dimensions because most stimulus situations an individual will encounter are complex enough that discrimination be-
tween stimulus elements is usually made on the basis of comparison of multiple dimensions rather than on the basis of quantitative differences along a single dimension. Because of this, and because gradations along a single dimension often can be translated into points along more specific combinations of dimensions, we shall assume that our usage of the term differentiation encompasses both the existence of multiple dimensions and fine gradations along single dimensions; but we will also assume that the latter is the more important aspect of cognitive structure in terms of influence upon receptivity to information.

We are left, then, with three major characteristics of cognitive structure - differentiation, integration, and comprehensiveness - and may presume that significant differences between structures on any of these dimensions will result in differences in the cognitive functioning and patterns of receptivity exhibited by individuals. With these three characteristics in mind, we will now offer a more detailed conceptualization of cognitive structure which will serve as the basis for the conceptual framework developed in the next chapter.

We will hypothesize that a cognitive structure is composed of a number of categories or concepts that are interrelated in a complex fashion. Each category, or concept, can

---

3 For example, points along the dimension "redness" may be translated into points along the dimensions "intensity of redness" and "purity of hue."
be imagined to consist of the location where a number of dimensions overlap and thereby define the category. Figure 3.2 gives a rough pictorial representation of such a definition of cognitive categories. The large circle is the area representing the category "ball" defined by the overlapping of portions of the four dimensions: size, hardness, roundness, and resiliency. Any object judged to have appropriate amounts of these four physical attributes (i.e., fall within the admissible ranges on these four dimensions) will be categorized as a ball. The circle within the larger circle represents the category "game ball." Again, the category is defined by the same four dimensions which define the broader category "ball", but the category "game ball" is more restrictive because the permissible range of variation along the four defining dimensions is narrower. Several objects (viz. a basketball, football, golfball, medicine ball, cotton ball, and moon) are then evaluated according to the four dimensions and located in the "cognitive structure" represented in Figure 3.2. This is done by placing a point on each dimension to indicate the amount of this attribute possessed by each object and then connecting these points so that the "location" of each object in the "cognitive structure" is shown by the area encompassed by the lines connecting the points. Thus, for example, the area contained by the green lines represents a medicine ball (which falls in the category "ball" but not in the category "game ball") and the area bounded by the blue
A pictoral representation of the categories "Ball" (large circle) and "Game Ball" (smaller circle) defined by four dimensions: size hardness, roundness, and resiliency. Shown "located" in this four-dimension "cognitive structure" are the six objects listed in the Key above.

FIGURE 3.2
lines represents a football (which falls in both the category "game ball" and the category "ball").

Some of the categories in a cognitive structure would be completely subsumed under others, e.g., the category "basketball" would be subsumed completely under the category "game ball" which in turn might be subsumed under the category "ball". Some of the categories would overlap without one or the other being completely subsumed, e.g., the categories "sociology" and "psychology" may overlap in a smaller category "social psychology". Yet other categories might be related to others only by virtue of their possessing a common dimension, e.g., the categories "bureaucracy" and "steam engine" may have in common the dimension "degree of entropy".

Building on this conceptualization of a cognitive structure, we can begin to envision the differences between cognitive structures characterized by differing degrees of differentiation, integration, and comprehensiveness. A more comprehensive structure would contain a much larger number of dimensions and categories available for evaluating objects or events perceived in the environment than a less comprehensive structure would. For example, a comprehensive structure might include the dimensions and categories relating to geography, transportation, economics, politics, sociology, aesthetics, psychology, religion and architecture for dealing with the problem of choosing a site for a
community development. A less comprehensive structure might include only dimensions and categories relating to shelter, climate, proximity to drinking water, and the availability of food supplies for dealing with the same problem. This difference in comprehensiveness of the two structures could significantly influence the receptivity patterns adopted by the two individuals as they evaluate prospective sites for a community development.

The use of an analogy between cognitive structures on the one hand and library classification and cataloging systems on the other is helpful for envisioning the differences between a more and a less comprehensive cognitive structure. In classifying a book or other object, the library is actually assigning a location to that object in the library collection. This location establishes a spatial relationship between this and other books in the library that is reflective of the relationships between their contents. In terms of our analogy to a cognitive structure, a particular class, or subclass, in the library classification system would be the analog of a particular category, or sub-category, in the individual's cognitive structure. Distinct from the process of assigning a book to a class or subclass, is the process of cataloging a book. This involves the identification of key attributes of the book (e.g., the topics dealt with by the book, its author or editor, its title) and the use of these attributes to indicate (through cards in the catalog) the various
access routes an individual can use to locate the book. For example, it might be possible that a book on erotic Japanese painting of the 18th Century written by Ino Mishiko might be found by an individual looking in the catalog under art, under painting, under eroticism, under Japan - art, under the title, or under the author's name. In terms of our analogy, these different aspects of the book are the analogs to the dimensions characterizing a stimulus in the environment. Just as the headings used in a catalog give an individual access to the classes or subclasses partially defined by these headings (and hence access to the books contained in them), so dimensions give an individual access to the cognitive categories defined, or partially defined, by these dimensions (and hence access to the elements of information the categories contain). In this way, it can be seen that what Bruner calls the "accessibility" of a category can be raised by the individual's noting one of its defining dimensions in the environment. For example, if the dimension "round" is a salient characteristic or dimension of the environment at a particular moment, categories partially defined by the dimension "roundness" will be made more accessible.

The reverse of this relationship between category accessibility and the salience of particular dimensions is also likely to be true. That is, given that a particular category has a high accessibility, it is likely the dimensions which
define that category will be more salient aspects of the environment for the individual than dimensions not defining the highly accessible category. An example from our library analogy would be the case of a student who has been studying works in the class "erotic Japanese art of the 18th Century" beginning to note Japanese influences in European art.

This library analogy is valid for characterizing comprehensiveness also. Comprehensiveness indicates the number of classes, or categories, into which a book, or a stimulus, can be placed. Thus, a college library using the Dewey Decimal System has ten such classes in its classification system while an art library using the Dewey system would have only one class. The college library is much more comprehensive than the art library in terms of classification structure. The implication of this structural difference is that the college library has a much broader range of receptivity to information than has the art library. The art library is receptive only to material which belongs in the class "art" and rejects information which belongs in the other nine classes of the Dewey Decimal System. The analogous relationship between the comprehensiveness of an individual's cognitive structure and the range of receptivity to information he is able to adopt is discussed in the next Chapter.

Differentiation of a cognitive structure, as mentioned earlier, is indicated by the number of dimensions available
for evaluating information encountered in the environment. In Figure 3.2 four dimensions are available for defining the categories "ball" and "game ball" and for evaluating whether or not objects encountered in the environment fit these cognitive categories. In Figure 3.3, a pictoral representation of these same two categories defined by the overlapping of only two dimensions, size and roundness, is presented. The "cognitive structure" of Figure 3.2 is therefore characterized by a higher degree of differentiation than is the "cognitive structure" of Figure 3.3. The implications of this structural difference becomes apparent when the objects included in the category "game ball" shown in Figure 3.2 are compared with the objects included in that same category shown in Figure 3.3. Because of the increased differentiation of the "cognitive structure" of Figure 3.2, it excluded from the category "game ball" two of the objects (medicine ball and cotton ball) included in this category in the "cognitive structure" of Figure 3.3.

Returning to the analogy between libraries and cognitive structures, a more complex picture of structural differentiation can be presented. A small high school library might subdivide its classification for art into the subclasses "painting", "sculpture", "architecture", and "crafts". In the subclass "painting" might be placed in alphabetical order such diverse works as a catalog of works by Rembrandt, a book titled Great Paintings of the
A pictoral representation of the categories "Ball" (large circle) and "Game Ball" (smaller circle) defined by only two dimensions: size and roundness. Shown "located" in this two-dimensioned "cognitive structure" are the six objects listed above in the Key.

FIGURE 3.3
Louvre, a book on how to paint with water colors, and a book called Renaissance Painters and Paintings. An art library, on the other hand, would subdivide its classification for art into far more specific classes and subclasses. The category "painting", for example, might be further subdivided into categories by medium (e.g., watercolor, oil, tempera, etc.), each of these into categories indicating geographical areas (e.g., France, China, Mexico, etc.) and each of these, in turn, into categories denoting historical period. A book on French watercolor painting in the 19th Century, then, would have its place in a specific class - a class quite distinct from those containing books about 19th Century oil painting in France, from those containing books about 19th Century Japanese watercolor painting, or from those containing books about 20th Century French watercolor painting. In contrast, the much less-differentiated classification structure of the high school library would place books on these subjects all in the same undifferentiated class "painting". The essential difference between the two types of library classification systems is the number of dimensions each uses for evaluating information about art. The high school library uses only one dimension - art form (i.e., painting, sculpture, crafts) - while the art library uses several dimensions just to define the category painting and its many subclasses. The implication of this structural difference is that the art library will be far more discrim-
inating than the high school library in evaluating the materials it acquires for its collection. An analogous difference between the differentiation of two individual's cognitive structures would have the effect of making one of the individuals much more discriminating in his evaluation of stimuli from the environment.

The third major characteristic of cognitive structure with which we will be concerned is integration. The degree of integration of a cognitive structure indicates the interrelatedness of the different categories making up the structure. Ausubel and Bruner seem to have stressed interrelationships of a hierarchical nature such as that depicted in Figure 3.4 which is a representation of the Dewey Decimal System's treatment of the classes "sociology", "social psychology", "groups", and "small groups". Each of these classes is related to the next more general class by virtue of its being completely subsumed by it. This hierarchical form of organization does not result in a very high degree of integration because categories are related to one another only within vertically connected groups.

4Credit for the library analogies is due to a very helpful librarian in the Cataloging Department of Frost Library at Amherst College.
A representation of the hierarchical organization of four classes within the Dewey Decimal System. Integration between the classes is limited to vertical interrelationships.

A more complex, and significant, way in which categories within a cognitive structure can be interrelated becomes apparent when it is recalled that categories are defined by the overlapping of dimensions. This makes possible horizontal, as well as vertical, relationships between cognitive categories. For example, the category "game ball" is related to the category "ball" in a hierarchical fashion by virtue of possessing the same defining dimensions. But the categories "coconut" and "tomatoes" can be related to the category "game ball" without any hierarchical relationship connecting them. The three categories are related by their having in common the dimension "roundness". With common
defining dimensions as the basis for relationships between cognitive categories it becomes feasible for a cognitive structure to be characterized by very complex and subtle relationships between categories. The more this is the case in an individual's cognitive structure, the greater its degree of integration. The implication of this is that such diverse categories as "ecology," "endocrinology," and "organizational change," which may be regarded as unrelated by an individual whose cognitive structure has a low level of integration, will, in the cognitive structure that is highly integrated, be related by the dimensions: "structural differentiation," "specialization of sub-parts," "interdependence of sub-parts," and "control of change." The consequence of this higher level of integration is that relationships between cognitive categories will create new dimensions which the individual can use for evaluating environmental stimuli. For example, the relationship between the categories just mentioned may result in the individual's generating the new dimension "degree of dynamic equilibrium."

This example also calls attention to another important point. This is the interrelationship between the three characteristics of cognitive structures we have been discussing. First, the greater the degree of differentiation of a cognitive structure, the greater the potential for high levels of integration. This relationship follows from the fact that common dimensions are the basis of interrelationships between
categories and the more dimensions defining each category, the more dimensions are likely to be common to large numbers of other categories. Second, the greater the integration of a cognitive structure, the greater the potential for high levels of differentiation since it is integration which leads to the generation of new dimensions and hence to greater differentiation. The primary purpose at this point is to characterize the three structural characteristics. Having done so, we will leave a more detailed discussion of their implications for the next chapter.

The Receptivity-Adaptability Profile

Up to this point we have been concerned with the individual differences (specifically, differences having to do with the organization of cognitive structure) which may influence the patterns of receptivity to information adopted by individuals. However, it was noted at the beginning of this chapter that a better understanding of the functioning of the basic antinomy identified by Jones and Gerard (see pp. 27-46) might be obtained by expanding their notion to include a consideration of important characteristics of the environmental situation which might also influence the functioning of the basic antinomy and hence the patterns of receptivity individuals will adopt.

We begin this expansion of the notions of Jones and Gerard and Rokeach by returning briefly to Bruner's hypotheses
regarding category accessibility (see pp. 48-50). Bruner (1957) suggests that an individual may be more receptive at a given time to information falling into certain categories or be more likely to perceive a given stimulus as belonging to one category rather than to another. This difference between categories Bruner calls category accessibility to indicate the accessibility or receptivity of a particular category to information at a given moment. Building on this notion, we can redefine the openness shown by an individual as being the number, or range, of his cognitive categories having high accessibility at a given moment. When faced with information in a problem situation, the more open person would have a broad range of categories available (i.e., categories with high accessibility) for classifying the different items of information in the environment. In contrast, a more closed person may at that moment have only a limited number of categories with high accessibility for classifying information from the environment. In effect, his receptivity to information is narrowed down, or focused, in such a way that he will receive only information fitting a small number of categories. As a result, he would be receptive to a much smaller proportion of the total information available than the open person, and he would either exclude the information which is not readily classifiable in his high-accessibility categories or be forced to distort the information in such a way that it would fit into these
few categories.

An important consequence of redefining the openness-closedness dimension in terms of the breadth or narrowness of the information spectrum covered by categories with high accessibility is that it removes the negative and disfunctional connotations of being "closed" that are attached to that term by Rokeach and others. Being closed no longer has to mean that a person is un receptive to information because it does not agree with his view of the world (the definition given the term by Rokeach and Jones and Gerard); now being closed can also be interpreted more generally to mean that the individual has focused his attention (for whatever good or bad, conscious or unconscious, reasons) on a limited, rather than broad number of categories of information.\footnote{It should be noted here, perhaps, that this re-definition of the openness-closedness dimension does not preclude an individual's being considered closed-minded in the sense that Rokeach uses the term. If an individual has only a narrow range of categories with high accessibility at a particular time, it could be that the narrowness is based on the desireability of focusing on information relevant to a specific problem; or, it could be that the narrowness is based on purely attitudinal criteria. In the latter case, all information of a counter-attitudinal nature could be excluded because the individual has low accessibility in those categories of his cognitive structure that pertain to matters contradicting his beliefs. Such a receptivity pattern would indicate that the individual is closed-minded. This issue will be discussed in more detail in Chapter IV with regard to the domination of receptivity patterns by particular types of category accessibility rules.} We are taken a step further in our expansion of the notion of openness-closedness into a notion of receptivity-
adaptability by some comments made by Ausubel. He introduces the idea that a discussion of individual differences in cognitive structures should include a concern with the relationship between an individual's structure and the characteristics of the situation in which he finds himself. It is in the context of discussing factors which influence meaningful reception learning that Ausubel identifies three variables of cognitive structure (Ausubel, 1963, pp. 28-29):

1. "...the availability in cognitive organization of relevant subsuming concepts at an appropriate level of inclusiveness to provide optimal anchorage" for the information received from the environment;

2. the extent to which the information is discriminable from the "established conceptual systems that subsume it;" and

3. the stability and clarity of the subsuming traces in the cognitive structure.

Here Ausubel is actually defining variables of cognitive structure in terms of the appropriateness of the structure to the information being encountered by the individual. In speaking of "relevant subsuming concepts," "appropriate level of inclusiveness," discriminability of the information from the "established conceptual systems," etc. Ausubel is implying that changes in either the cognitive structure or in the information in the environment could modify the appropriateness of the cognitive structure to the situation facing the individual. If this reasoning is extended, it is apparent that any static cognitive structure could not be
appropriate to all, or even a majority, of the varied circumstances an individual will encounter. To maintain appropriateness in a variety of problem situations, the individual's cognitive structure should be capable of change, i.e. cognitive restructuring. Along these lines, Piaget speaks of conceptual schemata having "scope[s] of application" (Piaget, 1950, p. 120) and of their having mobility or the ability to adapt themselves to new situations (Piaget, 1950, pp. 142-143). This notion of adaptability to differing situational characteristics leads us to the second aspect of our expansion of the open-closed dimension into the notion of a receptivity-adaptability profile.

Just as it is unlikely that a single, static cognitive structure could be expected to suit all circumstances, so it is equally unlikely that a single pattern of receptivity to information could be expected to suit a wide variety of circumstances. Therefore, rather than thinking in terms of an individual's having a certain degree of openness to information (i.e., having a certain range of categories with high accessibility), it is more fruitful to think in terms of the adaptability of the individual's receptivity. Is he capable of adopting a broad range of receptivity when the situation requires it and then switching to a narrower, focused pattern of receptivity when changes in the situation call for it? Cast in these terms, receptivity patterns take on a dynamic character rather than the static character
ascribed to receptivity by Rokeach or the open-before-a-decision-closed-after-a-decision character ascribed to receptivity in the Jones and Gerard concept of the basic antinomy's functioning. Characterizing an individual's receptivity to information now can be seen to involve much more than whether he is open or closed at a given instant. An appropriate description of an individual's receptivity must include:

1. a determination of what particular patterns of receptivity are most appropriate to the variety of situations the individual encounters in his environment;

2. a determination of the extent of the match between the patterns of receptivity adopted by the individual and the patterns of receptivity called for by the situations he encounters; and

3. a determination of the situational factors which are affecting the types of receptivity patterns the individual will adopt.

In determining the pattern of receptivity called for by a particular situation or in characterizing the pattern of receptivity adopted by an individual, it is necessary to examine two crucial elements of the receptivity pattern. The first is the scope of receptivity, broad vs. focused, indicated by the range of different categories in the individual's cognitive structure which have high category accessibility. We have discussed this aspect of receptivity patterns previously.

The second element of receptivity patterns which must
be examined is the rule, or rules, being applied by the individual to govern which categories will have high accessibility (i.e. be most open to information from the environment). There are at least four types of category accessibility rules which can be identified. These are:

1. **Content-Orientation** rules which determine that all categories having to do with a particular subject or aspect of the environment will have high category accessibility. The inverse of this type of rule would determine that all categories having to do with a particular subject or aspect of the environment will have very low category accessibility.

2. **Process-Orientation** rules which determine that all categories having to do with taking a particular approach or set of approaches to the situation will have high category accessibility (or in the case of the inverse, low category accessibility).

3. **Source-Orientation** rules which determine that all categories having to do with information emitted by a particular source or sources (e.g., an expert, authority figure, or grantor of rewards) will have high category accessibility (or in the case of the rule's inverse, low category accessibility).

4. **Attitudinal- or Belief-Valence** rules which determine that all categories having a particular valence (i.e., pro-attitudinal or counter-attitudinal valence) will have high category accessibility (or in the case of the rule's inverse, low category accessibility).
In addition to these four rules, two other cases influencing category accessibility should be mentioned. One is the possibility that category accessibility may appear to be completely random with no particular category accessibility rules being applied to govern the individual's pattern of receptivity. The other possibility is that whatever rule or rules are governing category accessibility will be superseded by characteristics of the information in the situation such as the novelty or the intensity of a particular stimulus. For example, three men in an apple orchard discussing apples may be functioning under a content-orientation rule to the effect that only categories having to do with apples will have high category accessibility. If there is suddenly a loud lion's roar behind them, it is likely that the "apples only" content-orientation rule will be superseded by a rule resulting in high category accessibility for those categories having to do with lions, modes of escape available in an apple orchard, the consequences of being eaten by a large hungry carnivore, etc.

Possessed of the ability to describe patterns of receptivity to information in terms of the two elements just discussed, i.e., the scope of categories with high accessibility and the rules governing category accessibility, it becomes feasible to identify the pattern of receptivity required by a particular situation and to compare that with the pattern of receptivity adopted by a particular individual in that
situation. If it were possible to create a number of problem-solving situations each of which requires a different pattern of receptivity, place an individual in each of these situations in turn, and then compare the patterns of receptivity adopted by the individual with those required by the situations, we would have a rough profile of the individual's ability to adjust his receptivity patterns to fit varying situations. However, such a profile of the individual's receptivity-adaptability would have little or no generalizability beyond the specific situations in which the individual's receptivity-adaptability has been observed. To achieve an R-A profile of an individual that does have some measure of generalizability, it is necessary to add another facet to the profile.

This additional facet is a concern with the situational variables that are having an influence on the individual in terms of the receptivity patterns he adopts. There are a large number of such situational characteristics which could be used for measuring the differences between problem-solving situations, but for purposes of manageability and for conceptual reasons discussed in Chapter IV, we will place all these situational characteristics into two categories and treat them as only two variables. The situational characteristics will be classified into those influencing the arousal level of the individual, and into those influencing the complexity of the potential information input to the individual. Factors con-
tributing to arousal of the individual would include time restraints, physical conditions, reward and punishment contingencies, the individual's involvement or interest in the situation, the individual's commitment to influencing the situation, etc. Factors contributing to the complexity of information input to the individual would include the changeability of the information, the number of sources emitting information, the novelty of the information, the intricacy of the relationships among elements of information, the size of the information load (i.e., the number of elements of information which are crucial, must be generated by the individual, must be rejected, etc.), etc. Rather than constructing an individual's receptivity-adaptability (R-A) profile from his information-processing behavior in randomly varied situations, attention to arousal factors and complexity factors permits the construction of R-A profiles for an individual under given sets of circumstances, e.g., high arousal-high complexity, high arousal-low complexity, low arousal-high complexity, and low arousal-low complexity. Such an R-A profile would permit generalizations to be made about the patterns of receptivity an individual is likely to adopt in the presence of given levels of the two situational variables, arousal and complexity.

The first step in constructing such an R-A profile for an individual would be to construct a typology of problem-solving situations that vary (a) with respect to the patterns
of receptivity most appropriate to them and (b) with respect to their situational characteristics. Thus each situation could be rated in terms of the presence of factors contributing to an individual's arousal level, in terms of the presence of factors contributing to information complexity, in terms of the scope of receptivity most appropriate to it, and in terms of the category accessibility rule(s) most appropriate to it.

Having rated the situations in the typology in the manner just described, the next step in constructing an individual's R-A profile would be to observe what patterns of receptivity the individual actually adopts in each situation included in the typology. His patterns of receptivity would then be compared with the appropriate receptivity patterns to determine the extent of the match between the two sets of receptivity patterns. The final step would then be to examine the relationships between the levels of the two situational variables (arousal and complexity) and the two receptivity variables (scope of receptivity and category accessibility rule dominance). Such an analysis would indicate what pattern of receptivity the individual would be likely to adopt under various situational circumstances.

A concrete example may be helpful in understanding the concepts we have been discussing in abstract terms. We will use the example of a single play in a football game as the situation and the quarterback as the example of the individual
whose pattern of receptivity we are interested in. First we look at the situational factors which determine the levels of the two situational variables, arousal and complexity. Contributing to arousal is a time limitation - there are only twenty seconds left in the game. Also contributing to arousal are the reward contingencies of the situation - it is the third-down-and-goal from the nine-yard-line, with the team behind 12-7 in the Super Bowl. The winners get fame and glory, the satisfaction of being the best team, $32,000 per player in winner's shares, and untold fortunes from product endorsements. Also contributing to arousal is uncertainty - the opponent's pass and rush defenses have been equally effective. A pass is more likely to gain the long yardage needed, but an interception, dropped pass, or fully-covered receivers are all possible obstacles to the success of a pass-play. A run is safe from any interception, but a fumble is possible and wide runs have not been effective against the opponent's defense while runs up the middle have been averaging only five yards per carry. All of these factors add up to a relatively tense situation which we would label "high arousal."

The situation is also characterized by factors contributing to high information input complexity. The information available to the quarterback is highly changeable because the opponents change their defensive formations several times

6The relationship between uncertainty and arousal is discussed at length in Chapter IV.
while the quarterback is in the huddle and after he has begun calling his signals at the line of scrimmage. Information complexity is also increased by the high information load, primarily in terms of information which must be rejected by the quarterback. This includes the sound of jet planes overhead, sirens and other traffic noise in the streets outside the stadium, thoughts of the weekend he spent in New York with last month's *Playboy* "Playmate," and remembrances of the sensation he had two plays ago when he was "sacked" by two 300-pound linemen. There are also the perspicacious comments from spectators yelling for a pass to wide-receiver "Lean Louie" Lowenthal, a run by "Slippery Sam" Salvatorre, and the talk in the huddle about the results of the Redskins' attempt at a double-reverse suggested by the President in a similar, crucial third-down situation.

Further complicating the information input is the inconsistent relationship between the intensity of different elements of information and their potential importance to helping the quarterback choose the correct solution to the problem facing him. The linebackers' obvious feints toward the line of scrimmage may be revealing a blitz or only be fakes, while their true intentions may or may not be reflected by their barely noticeable glances toward the receivers they would normally cover. The situation qualifies as a high arousal-high complexity situation.

With regard to the pattern of receptivity appropriate
to the situation it is apparent that the quarterback should have a focused, rather than broad, scope of receptivity. The categories with high receptivity should be limited to those having to do with information about the game itself, more specifically, those categories having to do with the probable actions of the defense, the whereabouts of open receivers, the timing of the snap from center, etc. The most appropriate pattern of receptivity would be dominated by content-orientation and source-orientation rules intended to include specific information, e.g. rules to the effect that "only categories having to do with the immediate play situation will have high accessibility," or "only categories having to do with information emanating from the coaching staff (not spectators or politicians) will have high category accessibility." Process-orientation rules, e.g., "only categories having to do with a passing approach will have high category accessibility," and attitude-valence rules, e.g., "all categories having to do with information which contradicts my opinion will have low accessibility," would both be inappropriate types of rules for this situation. All situations could be examined and rated in a similar fashion. Through such a procedure, individuals could be characterized, for example, as exhibiting appropriately broad scopes of receptivity under conditions of low arousal and moderate complexity, and to adopt receptivity patterns dominated by source-orientation and attitude-valence rules when arousal
reaches moderate levels.

In abstract terms, at least, we have moved from the limited notions of the open and closed minds of Rokeach and the Jones and Gerard basic antinomy to the concept of a receptivity-adaptability profile that allows us to characterize the functional adaptability of a person's receptivity over time and across varying circumstances. Such a means of characterizing an individual's receptivity would have important uses in predicting performance in various roles, performance under different conditions, etc., but our concern here lies in another direction. For us the importance of having a means of characterizing an individual's receptivity-adaptability is its usefulness as a tool for investigating factors which give rise to individual differences in receptivity-adaptability. Assuming that individuals must have adequate receptivity-adaptability if they, and their society, are to cope with the problems resulting from the socio-historical conditions outlined in Chapter I, it becomes crucial that educators be able to maximize the likelihood of each individual's attaining a minimal ability to adopt and maintain appropriate patterns of receptivity in changing circumstances. If the search for these factors is to be productive, it must be guided by a conceptual framework which proposes an explanation of the dynamics which underlie differences in receptivity-adaptability. It is the task of building such a conceptual framework to which we now turn in Chapter IV.
In the last chapter we developed the notion of a receptivity-adaptability profile as a more useful way of looking at an individual's receptivity to information than the open-vs-closed concept of receptivity put forward by Rokeach and the basic antinomy notion developed by Jones and Gerard. We also suggested that the patterns of receptivity exhibited by an individual under different circumstances reflect underlying characteristics of that individual's cognitive structure. In describing the characteristics of cognitive structures - for example their being made up of cognitive categories whose interrelationships reflect the interrelationships of environmental phenomena, their being characterized by different degrees of comprehensiveness, differentiation, and integration, and also their being characterized by some categories having higher accessibility to environmental stimuli than others - we portrayed the cognitive structure in a relatively static state. This is in contrast to our contention that receptivity should be looked upon as a dynamic process rather than as a static state. Therefore, we have reached a point where it is appropriate to discuss the dynamic properties of cognitive structures and their influence upon the dynamic process of receptivity,
or, as we have labelled it, receptivity-adaptability.

Dynamic Views of Cognitive Structure

Several of the theorists discussed in the last chapter have devoted some of their thinking and writing to the problem of how an individual's cognitive structure develops and changes. Ausubel (1963) believes that growth of the cognitive structure can result from the systematic exposure of the individual to properly organized information. The information must be presented in a sequence that first provides a general framework of subsuming categories ("traces" in Ausubel's terminology) which is firmly anchored to existing categories in the structure by careful efforts to highlight the logical connections between the new categories and the stable, already present ones. Subsequently, information is presented which differentiates the newly acquired framework of categories into more and more discrete sub-categories. This process of anchoring "advance organizers" to stable parts of the cognitive structure and then supplying more detailed information to form sub-categories constitutes Ausubel's conception of meaningful verbal learning.

Bruner, who, as an advocate of "discovery learning," has disputed Ausubel's contention that cognitive growth will result merely from the presentation of carefully organized information, emphasizes the necessity of some motive force being present before cognitive growth will take place.
Bruner ([Bruner et al., 1966, pp. 11-29]) argues that this motive force derives from an individual's experiencing a conflict between his cognitive representation of the world and the "appearance" of the world. Bruner interprets this conflict as being a conflict between representational modes used by the individual in constructing a model of reality. Thus the individual's symbolic representation of the world may be contradicted by events perceived in the environment that are consistent with his "ikonic" or "enactive" representations of reality. This conflict is resolved when the individual reorganizes his cognitive representation in such a way that the new relationships between symbolic categories reflect more accurately the relationships between environmental phenomena.

Harvey, Hunt, and Schroder (1961, pp. 85-112) propose a stage theory of cognitive development (their term is "conceptual development") which has the individual's cognitive structure passing through four stages en route from a concrete structure to an abstract structure.¹ The progression through the four stages is hypothesized to result from a Hegelian process of conflict between "antithetical poles or opposites in development" followed by their

¹The concrete-abstract dimension of a structure is a measure of its dependence upon the "physical attributes of the activating stimulus" (Harvey, Hunt, and Schroder, 1961, p. 3).
integration and the subsequent emergence of two new antithetical poles. The poles, in pairs of A-B, C-D, and E-F, represent variations of the two opposites, dependence and independence. Harvey, Hunt, and Schroder support their belief in the likelihood of such a process by noting several points:

1. The discrimination of extreme opposites can be made more easily than the discrimination between less different stimuli. Once these opposite poles have been discriminated, the person is in a position to make finer and more difficult discriminations. The reference points placed around the extreme limits of a given conceptual system (that is, the two poles) therefore serve as anchorages for making finer discriminations with the "gap".

2. Interpretations based on opposite poles are more easily integrated than differentiations based on concepts that have no necessary relationship to each other. That is, black and white are opposites, but they are also both colors. Therefore the very opposition of the two poles on the same dimension facilitates integration whereas the integration of differentiations based on unrelated anchors would be more difficult.

3. If the person can differentiate such opposing poles and integrate them, such a process represents the "optimal" developmental leap because the emerging conceptual system would have the characteristics of maximal abstractness relative to the poles of the original concept on which it was based.

The facilitating effects of "opposites" upon progression may be viewed in another way. Progression is facilitated under conditions of clarity of the initial concept, openness of the developing
concept to discrepant (particularly opposing) events, and the successful integration of these two systems of mapping into a new conceptual schema.

This view of the process of development is one of emerging concepts. When training conditions favor the generation of discrepant conceptual orderings (opposing poles) a new synthesis can emerge if the opposing or discrepant differentiations can be integrated. The new synthesis contains modified aspects of the two initially discrepant poles. When a new synthesis emerges, it in turn serves as a baseline for the possible generation of new discrepant differentiations and the development of new syntheses.

Piaget's theory of cognitive development also proposes that cognitive growth takes place in stages, moving from a sensorimotor period to a preoperational period, to a concrete operational stage, and finally, to the stage of formal operations. But the stages Piaget identifies are less important to our concern with the relation between cognitive development and receptivity-adaptability than are his concepts of equilibrium and equilibration.

Piaget (1957) views the interaction between the individual and the environment in terms of a balanced vacillation between the two processes of assimilation and accommodation. Assimilation is the process of the individual's cognitive structure (schema's in Piagetian terminology) taking in environmental stimuli and organizing it in accordance with
the model of reality implicit in the cognitive structure. Accommodation is the process of the individual's cognitive structure undergoing changes or reorganizations to make it more congruent with perceived reality. When the cognitive structure has achieved a balance between assimilation and accommodation, Piaget considers it to be in a state of equilibrium. According to Ginsburg and Opper (1969, p. 172), "When in equilibrium the cognitive system need not distort events to assimilate them; nor need it change very much to accommodate to new events. Equilibrium then, involves activity, openness, and a state of relative harmony with the environment."

But the process by which cognitive structures achieve higher and higher levels of equilibrium is the process Piaget calls equilibration. Piaget theorizes that the equilibrium of a structure is upset when the individual encounters novel information in the environment which cannot be assimilated by his cognitive structure. However, if this disturbance of the equilibrium of the structure results from a condition of "moderate novelty," the cognitive structure accommodates to the new information and thereby undergoes development which results in re-establishment of equilibrium at a higher level. Piaget characterizes the condition of "moderate novelty" as existing whenever the incongruity between perceived reality and an individual's cognitive structure is large enough that the structure cannot assimilate the new information yet the
incongruity is small enough that a reasonably small change in the structure will result in the accommodation of the structure to this new perception of the environment. Piaget maintains that the individual seeks out aspects of the environment that are "moderately novel" because he becomes habituated or satiated with familiar stimuli (not sufficiently incongruous) yet also remains unattracted to radically novel stimuli because they do not correspond to anything in his cognitive structure (Piaget, 1952, p. 68). Thus, only if there are sufficient opportunities for the individual to encounter moderate novelty will the process of equilibration, or cognitive growth, be a consequence.

Berlyne, who has studied with Piaget and his co-workers in Switzerland, regards himself as an S-R psychologist rather than a cognitivist, and argues that cognitive behavior must be explained in terms of S-R associations. Berlyne recognizes the likely existence of internal stimuli and responses which constitute mediating processes between environmental stimuli and overt behavior much as cognitivists argue that the components of a cognitive structure mediate between the environment and the individual's behavior. However, Berlyne insists that these "internal responses" operate in accordance with the same laws of behavior governing overt responses (1965, pp. 14-19). He has gone on to explore the effects of what he labels "conceptual conflict" upon human behavior and, in so doing, has translated many important
Piagetian notions into the language of the S-R psychologist. He has also developed and investigated a theory of "directed thinking" ("thinking whose function is to convey us to the solutions of a problem" (Berlyne, 1965, p. 19)) that is based on Maltzman's extension of Hull's notion that response-chaining leads to the formation of compound habit-family hierarchies. Berlyne contends that the combining of these habit-families into what he terms "Transitive-Group" and "Tree-Structure" Habit-Family Hierarchies forms the mediating structure which directs an individual's thinking and purposeful interactions with the environment. In constructing this theory, Berlyne touches upon many issues that are critically related to our conceptualization of the development of an individual's R-A profile. For this reason it is worth sketching the outlines of his theory of structure and direction in thinking.

Berlyne (1965) begins by arguing that thinking evolved as a consequence of its contribution to biological adaptation. His argument is cast in the terminology of information theory with the problem of the organism's functioning effectively in his environment being conceived of as a problem of matching his actual response to the optimal response. Presumably the organism must choose one of a number of possible alternative responses in any given stimulus situation, and, Berlyne contends, will seek information which will reduce the uncertainty as to which of the possible actual responses
matches most closely the optimal response. Because the information from the external stimulus situation is often insufficient to reduce this uncertainty, a human will rely on learning and thinking to supplant the information available from the environment. When repeated encounters with similar stimulus situations occur, the individual acquires a set of alternative response-chains to each stimulus situation. For each situation these response-chains are grouped into what Maltzman calls compound habit-family hierarchies with the placement of any habit-family of responses within the hierarchy dependent upon the generalized reinforcement which that set of responses has received in the past. Thus, if one habit-family of responses has resulted in the individual's making an actual response that matches the optimal response for that situation, that particular habit-family of responses to that particular situation will be reinforced and repetitions of this reinforcement will result in that habit-family's having a higher reaction potential in that stimulus situation (i.e., in its being higher in the habit-family hierarchy) than other habit-families.

This structuring of the individual's responses is reflected in the receptivity patterns of the individual in the form of his rejecting initially information (i.e., stimulus characteristics of the situation) which would serve as stimuli to evoke responses that are low in the compound habit-family hierarchies. On the other hand the individual
will tend to attend selectively to those stimulus aspects of the situation which evoke the response patterns which are high in the compound habit-family hierarchy. If we translate this portion of Berlyne's theory into the language we used in Chapter III to discuss receptivity-adaptability, the result would be the statement that those categories of an individual's cognitive structure which have been associated with behavior that has been rewarded in a particular situation will have higher category accessibility than those categories which have not been associated with rewarding behavior sequences in that particular situation.

The portion of Berlyne's theory which is most pertinent to our immediate concern with how cognitive structures develop and change, is his discussion of the notion of conceptual conflict and its role in motivating directed thinking. Berlyne (1960) believes that an individual will experience conceptual conflict any time a stimulus situation elicits two or more conflicting responses. This would presumably occur (1) when the stimulus situation is sufficiently novel that no response pattern has acquired a greater reaction potential than any other, (2) when the situation is associated with response patterns with equal reaction potential, or (3) when the reaction potential of the previously-favored response pattern has been reduced to a point equal to other response patterns because enactment of the previously-favored response pattern has failed to bring about the sought-after consequences.
Berlyne believes that the individual experiencing conceptual conflict, or uncertainty (if we return to the information theory terminology Berlyne uses interchangeably with the term conceptual conflict), will have a drive to reduce the uncertainty by engaging in directed thinking which will result in the response pattern which leads to the successful outcome of the situation (i.e., by discovering the optimal response). By engaging in directed thinking, the individual provides himself with information not available in the immediate stimulus situation which is causing the conceptual conflict. He can then use this information to relieve the conceptual conflict in one of four ways: (1) disequalization of the reaction potentials of the conflicting responses; (2) swamping the conflicting responses by the introduction of a new response with a much higher reaction potential than all of the conflicting responses; (3) conciliation of the conflicting responses by revealing that the conflicting symbolic responses are not necessarily incompatible; and (4) suppression of the "thoughts about conflict-ridden subject matter or avoiding stimuli that tend to evoke such thoughts." (Berlyne, 1960, p. 260)

Growth of the cognitive structure, or in the belief of Berlyne, the development of new habit-family hierarchies, results from the reduction of conceptual conflict when the directed thinking engaged in by the individual leads to the development of new "solution chains" of responses within a
compound habit-family hierarchy. These solution chains can be likened to paths leading from the stimulus situation through a number of intermediate symbolic stimulus-response pairs, or "situational thoughts," representing successive changes in the state of the environment until the last situational thought represents the desired state of the environment. For example, a quarterback who finds himself on his own 20-yard-line in a third-and-fifteen-yards-to-go stimulus situation will construct a solution chain consisting of symbolic representations of changes in the state of the game which will end in the symbolic representation of the state of the game which has one of his teammates having just scored a touchdown. Connecting each of these situational thoughts with the ones preceding and following it, will be what Berlyne calls a "transformational thought," or symbolic stimulus-response pair which represents the actions taken to transform each stimulus situation into the one following it in the solution chain. The football quarterback would thus link each of his symbolic representations of the stages of the game (between his standing behind the line of scrimmage at the twenty yard-line and the scoring of the touchdown) with a symbolic representation of the actions which would bring about these developments, e.g. his completing a 63-yard pass to the wide receiver. If the individual is rewarded by success when he performs the overt responses contained in the new solution chain, the reaction potential of this set
of responses will be increased, thereby raising it within the hierarchy of the compound habit-family. When faced with a similar stimulus situation, the individual will experience less uncertainty or conceptual conflict because he has high in his repertory of responses the new solution chain which has successfully coped with past occurrences of this particular stimulus situation. Further growth will not take place until the individual experiences conceptual conflict because this newly acquired solution chain fails to cope with a stimulus situation which has elicited it (i.e., the sixty-yard pass does not work in the third-and-fifteen situation because the opponents use double coverage on the wide receiver).
When such a solution chain fails to cope with the stimulus situation and no other response chains in the compound habit-family hierarchy are successful in coping with the situation, a new solution chain containing a different set of situational and transformational thoughts must then be constructed. In constructing this new solution chain, the individual may give new attention to elements of the stimulus situation which were not previously noticed (e.g., pass coverage being used by the opposing team).

In noting the role of conceptual conflict in directed thinking (i.e., the development of new solution chains and their combination into compound habit-family hierarchies), Berlyne explicitly builds a link between his theory and those of the cognitivists. This link is his contention that directed
thinking motivated by conceptual conflict is at the heart of Piaget's concept of the role of moderate novelty in the process of equilibration (Berlyne, 1965, pp. 273-275).

The Conceptual Framework

Incongruity, uncertainty, and arousal. Berlyne and Piaget have provided us with the two essential links between the dynamics of cognitive structure and receptivity-adaptability. The first link is the notion that uncertainty (i.e., conceptual conflict or moderate novelty) is the result of an individual's perceiving a conflict between his cognitive representation of the environment and the actual information he is receiving from it or of an internal inconsistency within his cognitive representation itself. The second link is the notion that this uncertainty motivates the individual to take some action to mitigate this conflict and thereby escape from the condition of uncertainty. The three choices open to the individual are: (1) to tolerate the state of uncertainty; (2) to seek information from the environment, stored in his cognitive structure, or generated by directed thinking which will allow him to reconcile the conflict between his cognitive structure and the information present in the situation by making appropriate changes in his cognitive structure; or (3) to avoid exposure to, ignore, or alter those elements of information in the environment that are in conflict with his cognitive structure. His choice of either of the last
two alternatives will determine the pattern of receptivity to information which the individual will adopt, and, we will argue below, the characteristics of the individual's cognitive structure in combination with the characteristics of the stimulus situation will determine which of the three means of reducing uncertainty an individual will use.

In developing a conceptual framework to explain the dynamics of receptivity-adaptability, we begin with the assumption that all interactions between the individual and his environment are mediated at their interface by the individual's cognitive structure. This cognitive structure is the individual's symbolic model of the environment and is built up of numerous categories or concepts representing the ranges of phenomena the individual has encountered in the environment. The relationships between these categories reflect the individual's perceptions of the relationships between the phenomena which in the past have been present in his environment. When the individual encounters a set of phenomena in the environment he arrives at an understanding of these phenomena by sorting them into their appropriate categories in his cognitive structure, or in the terminology of Piaget, he assimilates them into his structure (presuming his structure is comprehensive enough to include categories covering all the perceived phenomena). By assimilating the current elements of the environment into his cognitive structure, or symbolic model of the world, and presuming adequate integration and
and differentiation of the structure, the individual is able
to discover the relationships between these phenomena and
between past and future phenomena. The individual is able to
discover these relationships because they already exist in
the structure of his cognitive representation of the world.
The categories into which the phenomena have been assimilated
will be related in particular ways to other categories in
his cognitive structure and these relationships between cate-
gories allow the individual to predict the existence of
similar relationships between elements of the environment.
For example, if the individual perceives a bimetallic bar
about to be placed over a flame, these phenomena will be
assimilated into categories having to do with flames, metals,
and methods of fastening strips of metal together. Having
assimilated this information into his cognitive structure,
the individual then takes note that the categories having to
do with metal have as one dimension their behavior in the
presence of heat and that this dimension relates it to the
categories having to do with flames. One relationship
between the categories "metal" and "flame" in the cognitive
structure is that metals expand when exposed to heat. If
his cognitive categories having to do with metals are ade-
quately differentiated, the individual will also note that
the rate of expansion is different for each of the two metals
fastened together to make the strip. Finally, the individual
takes note of the relationship between the "methods-of-
fastening-metal-strips-together" categories and the "flame" and "metal" categories and realizes that the two strips of metal will be held together in spite of the presence of heat and in spite of the different rates of expansion of the two metals. On the basis of these interrelationships between the categories of his cognitive structure the individual may be able to predict that the bimetallic strip, when exposed to the flame, will bend in such a way that the faster expanding metal strip is on the outside of the curving strip.

If an individual encounters phenomena in his environment which are incongruent with his cognitive structure - that is, if the objects and events he perceives in the environment do not conform to the representations and relationships present in his cognitive structure - the individual is no longer able to predict successfully the occurrences of those phenomena in his environment. For example, if the individual's categories having to do with metal and heat are not adequately differentiated, the only relationship between these categories which may exist in his cognitive structure is that when heat is applied to metal, it first softens and then liquifies. This individual would predict that the bimetallic bar, when exposed to the flame, would soften and bend down toward the floor. If he then observed that the bar bends up toward the ceiling, apparently having softened as expected, but unexpectedly defying the force of gravity, the individual finds that his cognitive structure does not
allow him to successfully predict environmental phenomena having to do with metals exposed to heat. Such an individual is thus placed in a state of uncertainty regarding the behavior of metals exposed to heat.

This state of uncertainty (or conceptual conflict in the terminology of Berlyne) can be predicted to result in an increase in the arousal level of an individual. An explanation of this prediction requires a short digression and the introduction of a concept developed by Harold Kelley and J. W. Thibaut (Thibaut and Kelley, 1959). In formulating their model for explaining the behavior of individuals interacting in groups, Thibaut and Kelley argue that an individual has "a comparison level of outcomes" which is an indication of what he regards as a minimally acceptable level of reward to be received as the result of an interaction with other individulas. The Comparison Level (CL) is the standard against which an individual measures the outcomes (rewards or costs) of any social interaction in which he takes part. His CL is a sort of neutral point, or average outcome level to which he has become habituated. Any level of outcomes above his CL is relatively satisfying and any level of outcomes below his CL is relatively unsatisfying. An individual's Comparison Level for alternatives, or $CL_{alt}$, is the outcome level he can expect from the best alternative social interaction available to him. If given the opportunity, the individual will take part in that particular social interaction which will result in the best outcomes for him, i.e., that social inter-
action having the highest $CL_{alt}$.

If we generalize the notions of $CL$'s and $CL_{alt}$'s so that they apply to any sequence of behavior, whether part of a social interaction or not - just any sequence of behavior involving an interaction between an individual and the environment - we have a useful method of explaining the relationship between arousal and uncertainty. The $CL$ can then be regarded as the general level of outcomes to which the individual has become habituated in his interaction with the environment or with which the individual is satisfied as a result of these interactions. Thus, most of the habitual behavior patterns he follows in interacting with the environment can be predicted by him to result in his receiving outcomes roughly equal to his $CL$. If some occurrence in the environment disrupts a habitual behavior pattern being enacted in pursuit of the usual level of outcomes, the individual is no longer able to predict that he will achieve outcomes at the $CL$ level. This disruption of his habitual behavior patterns, either by the failure of his responses to have their usual effect on the environment or by obstacles standing in the way of his enacting the response sequence composing the habitual behavior pattern, thus results in the individual's experiencing uncertainty regarding what the immediate outcomes of his interactions with the environment will be. If we presume (as Thibaut and Kelley do) that an individual will always try to optimize the outcomes of his interactions
with the environment, or as Berlyne phrases it, always seek

to match his actual response with the optimal response in

any situation, then we can conclude that any uncertainty

regarding what level of outcomes he will receive will motivate

the individual to take actions that will restore his ability

to predict the occurrence of environmental phenomena and thus

his ability to maximize the outcomes he receives as a result

of his interaction with the environment. This motivation con-

stitutes the arousal which results from a state of uncer-

tainty.²

In our later discussion it is important to make dis-

tinctions between what might be regarded as positive arousal

(excitement), ambivalent arousal (thrill), and negative

arousal (anxiety). Positive arousal could be expected to

result when the disruption of a habitual behavior pattern

opens up the possibility that enactment of a new behavior

sequence will result in higher outcomes than usual - that

is, when it is predictable that the $CL_{alt}$ of the new behavior

sequence will be higher than $CL$, positive arousal is likely.

An example might be a gourmet who usually eats his wife's

cooking and has come to expect a certain amount of pleasure

from these meals (i.e., the habitual behavior pattern of

eating his wife's cooking results in predictable outcomes at

²For a concise review of the concept of arousal in

motivation theory, see Appley, 1970, pp. 489-492. For a

more complete treatment of the role of uncertainty in arousal,

see Berlyne, 1960.
the level of CL). If this usual eating pattern is disrupted by an invitation to the home of a renowned chef from Afghanistan, the gourmet can no longer predict the level of outcomes he is likely to receive as a result of eating for the first time a meal prepared by a famous Afghan chef. Though never having eaten Afghan cooking, he believes it will be better than the usual dinner his wife would prepare (i.e., predicted $CL_{alt}$ is higher than CL), and, therefore, the gourmet experiences pleasurable excitement as a result of his uncertainty regarding what the night's dinner will be like.

Should an individual have reason to predict that the outcome of the disruption of his usual pattern of behavior will result in outcomes lower than those he expected from the habitual behavior pattern (i.e., if the predicted $CL_{alt}$ is lower than his CL) the individual would experience negative arousal, or anxiety, as a consequence of the uncertain state in which he finds himself. For example, if our gourmet breaks out in hives at the sight of lamb in any form and gets itchy eyes when he has eaten anything containing goat's milk, and there is a chance that the Afghan chef will make these two foodstuffs the central ingredients of the evening repast, our gourmet is likely to experience anxiety as a result of his uncertainty regarding what the night's dinner will be like. The actual level of arousal, whether the arousal is pleasurable excitement or unpleasant anxiety, will increase
as the predicted difference between the $CL_{alt}$ resulting from the disruption and his CL increases. The better, or worse, the gourmet believes the Afghan meal will be than the one his wife would have prepared the higher the arousal resulting from the uncertainty caused by disruption in his usual dining behavior.

If the disruption in an individual's usual behavior patterns results in uncertainty that the individual can predict will lead to outcomes either above or below his CL, he/she is likely to experience arousal that is ambivalent (i.e., both negative and positive at the same time). An example of a situation giving rise to this sort of arousal would be a rookie race car driver entering a new car in an important race. He can predict that his fast, new car will help him to a victory and net him fame and fortune (i.e., outcomes very high above his CL) or, at the other extreme, he can predict that the new car will lead to his taking a corner too fast and having a fatal accident (i.e., a $CL_{alt}$ far below his CL). Given these conflicting predictions, the rookie driver might experience ambivalent arousal.

The individual's predictions as to the direction and amount of the difference between his CL and the $CL_{alt}$ made likely by the disruption of his habitual behavior patterns are made on the basis of two sets of factors. The first set of factors are the situational characteristics accompanying the state of uncertainty. As mentioned in Chapter III
(pp. 80-82) these were: time constraints upon behavior; presences or absence of conditions causing physical discomfort; potential social, material, or physical rewards or punishment contingencies, etc. These situational characteristics will influence the individual's judgements regarding the eventual outcomes of a particular situation and will therefore influence the extent to which his being in a state of uncertainty increases his level of arousal.

The second set of factors which will influence the increase in arousal the individual will experience in a particular state of uncertainty are his combined past experiences in coping with uncertainty. If the individual's past experiences with uncertainty have largely been followed by rewarding outcomes (either because he successfully overcame the uncertainty and was able to bring about rewarding outcomes himself, or because the outcome of uncertainty was always a "pleasant surprise") he is likely to experience a positive arousal (excitement) and a higher level of arousal than an individual who has not experienced anything of consequence as the outcome of the uncertainties he has encountered. On the other hand, if an individual's past experiences with uncertainty have been followed most often by unpleasant occurrences, he is likely to experience a negative arousal (anxiety) at a higher level than the individual who had not encountered anything of importance subsequent to experiencing uncertainty. These are, of course, polar cases. Most individuals' reactions
to uncertainty would be geared more specifically to the contexts of their own past experiences with uncertainty. In the case of a certain person, for example, uncertainty encountered at an amusement park may always result in pleasurable excitement whereas uncertainty encountered during a final exam may always result in unpleasant anxiety.

Cognitive restructuring and the reduction of uncertainty. Given that the individual is motivated to a greater or lesser degree to reduce the uncertainty resulting from the incongruity between the environment and his cognitive structure, the individual can, as mentioned earlier, (1) tolerate the arousal level caused by the uncertainty, (2) seek information which will help him reconcile the incongruency by making changes in his cognitive structure, or (3) avoid those elements of information in the environment which give rise to the incongruency. If we presume that the information in conflict with the cognitive structure is of importance to the survival and effective functioning of the individual, then the recommended action is for the individual to reconcile the incongruency by making changes in his cognitive structure.

Making appropriate changes in the cognitive structure requires that the individual seek information, either in the environment or stored in the cognitive structure itself which will: (1) identify the new dimensions which must be added to his cognitive categories (i.e., increase differentiation of his structure), (2) identify the way in which
these new dimensions result in new relationships between
categories (i.e., increase the integration of his structure),
and/or (3) identify how these new dimensions should be combined
to form new categories (i.e., increase the comprehensiveness
of his structure). For example, the student who experiences
the incongruity between his cognitive structure and the en-
vironment when the bimetallic bar bends toward the ceiling
when heated may be sufficiently aroused by the resulting un-
certainty that he seeks information which will reconcile the
conflict. He may first seek to reconcile the incongruity
without attempting any change in cognitive structure by assum-
ing that he did not "see all there was to see" in the situ-
tion. By reexamining that portion of his cognitive structure
having to do with metals he may remember that some metals
can be attracted by a magnet. "Aha! There must be a strong
magnet pulling on the end of the bar and causing it to turn
up when the heat softens the bar sufficiently." Having formed
this hypothesis the individual may reexamine the environment
in hopes of finding the strong magnet in the ceiling. Fail-
ing to do so, he may seek further information from his cog-
nitive structure. If the category "magnetism" retains high
category accessibility, the individual will be more receptive
to information fitting that category, e.g., magnets can also
repel magnetized metals. "Aha! The strong magnet is located
under the table below the tip of the bimetallic bar." When
investigation disproves this hypothesis, the individual may
abandon all magnetism explanations (i.e., that category's accessibility is decreased) and seek information in other categories. If the puzzled student then sees someone move a metal ball freely back and forth through a metal ring, then heat the ball over the flame and be unsuccessful in making the ball fit through the same ring, the student may again give attention to the categories "heat" and "metal" and perhaps grasp a new dimension which relates these two categories, namely, heat not only softens metal but makes it expand. Further information-seeking might then be directed toward investigation of this relationship, i.e., measuring the lengths of strips of different metals before and after heating them to see how much and how fast each one expands. The investigation of this new relationship might then lead to increased differentiation of his cognitive structure (i.e., addition of more dimensions to categories having to do with metals) with the eventual result that our curious student finally realizes why the bimetallic strip behaves as it does when exposed to heat. The points being illustrated are:

(1) that uncertainty can be reduced, and therefore arousal mitigated, by the individual's making changes in his cognitive structure which make it a more accurate representation of his environment, and (2) that this restructuring requires information-seeking on the part of the individual.

If cognitive restructuring is the most advantageous way of dealing with uncertainty, we would presume that all
individuals would react to uncertainty by being open to new information and by exhibiting a willingness to change the beliefs contained in the present organization of their cognitive structure. Such behavior is the epitome of the open side of the Jones and Gerard basic antinomy (see pp. 26-44). But, as was stressed in our discussion of the support for the existence and functionality of the closed side of the basic antinomy, humans have a strong tendency toward being closed to new and conflicting information and toward exhibiting a desire to preserve their existing beliefs. We return again to Rokeach's contention that belief-disbelief structures perform two opposing functions: (1) to help the individual know and understand the world and (2) to help the individual ward off threatening aspects of the world. Neither Rokeach or the consistency theorists offered an adequate explanation of the sources of these two needs, but we have now reached a point in our conceptual framework where we can offer such an explanation.

The heart of this explanation lies in the relationship between uncertainty and arousal. As noted above, a cognitive structure enables an individual to predict the occurrence of events in the environment. To the extent that the individual can make successful predictions, he will be in a better position to match his actual responses to the optimal responses, i.e., he will be able to behave in a manner which maximizes the benefits and minimizes the punishments he
receives from the environment. When the individual encounters uncertainty he experiences arousal (positive, negative, or ambivalent). In an aroused state he is ready to take action - action which gives him the best of the alternative outcomes available. But such action is predicated on knowing and understanding the world. Hence the need to know and understand the world has as its source the arousal to action that is a consequence of uncertainty. Carried to its extreme, the individual may even have as his motivation to have an accurate cognitive representation of the world the desire to take actions which place him in situations of uncertainty so that he can experience the consequent positive or ambivalent arousal (excitement or thrill).

Should an individual find himself faced with uncertainty that is causing him to experience negative arousal, but he sees no possibility of taking actions that will bring his uncertainty to a pleasant end, he is in need of some way of escaping from the conditions causing him to experience anxiety. Herein is the source of the other basic need identified by Rokeach - the need to ward off threatening aspects of the world. Faced with uncertainties he can not overcome, an individual experiences negative arousal and is thus motivated to "ward off" these threatening uncertainties.

Structural characteristics and the difficulty of cognitive restructuring. Remaining to be explained is the source of the need not to know and understand reality, which
is served by the "ward-off-threat" function of the cognitive structure. This explanation also rests on the relationship between uncertainty and arousal, but it also requires further discussion of the conditions which must be present for cognitive restructuring to occur. The primary condition that must pertain for successful cognitive restructuring to take place is that the incongruency between the cognitive structure and the phenomena perceived in the environment must be large enough that it is noticed by the individual, yet small enough that the changes in the cognitive structure required to remove the incongruency are not so large that the individual is incapable of making them. This condition of optimal incongruity is analogous to Piaget's concept of moderate novelty (see pp. 92-95). If the uncertainty encountered by the individual is not within the limits of optimal incongruity, cognitive restructuring is too difficult and not likely to take place. Therefore, uncertainty exceeding the level of optimal incongruity prevents restructuring and the relief from anxiety it would achieve. If an individual is to avoid undue anxiety, there must be a high probability that the incongruities he encounters are within optimal limits. Determining what this probability will be are a number of factors, most of which have to do with the structural characteristics of the individual's cognitive structure.

In the last chapter we identified three characteristics of cognitive structures which were useful for describing the
differences between one individual's cognitive structure and that of another. These three characteristics were: (1) comprehensiveness or the range of different phenomena for which there exist categories and dimensions in the cognitive structure; (2) differentiation or the subdivision of the structure into smaller, but related, categories having more exact criteria (i.e., more dimensions defining each category) for the classification of stimuli; and (3) integration or the extent to which sub-parts of the cognitive structure are interrelated by their having common dimensions. Greater degrees of any or all of these structural characteristics increase the probability that the individual will encounter optimal incongruities between the environment and his cognitive structure.

Greater comprehensiveness increases the probability of encountering optimal incongruity because a broad range of categories and dimensions in a cognitive structure increases the likelihood that one or more categories will bear some relation to the phenomena contributing to the incongruity. If this is the case, the size of the incongruity is more likely to be small enough to fall within the range of optimal incongruity. For example, the student struggling with the bimetallic-strip problem is much more likely to be able to make the appropriate changes in his cognitive structure necessary for an understanding of the problem if his cognitive structure contains the categories "molecules", "kinetic energy," and "expansion" than if he has none of these categories.
Greater differentiation of a cognitive structure increases the probability of an individual's encountering optimal incongruity by increasing the likelihood that the incongruity encountered is \textit{large enough} to fall within the optimal range. When more dimensions are used for evaluating phenomena encountered in the environment, it is more likely that an individual will notice differences between these phenomena and realize they do not fit in the same category or do not conform to the same relationships indicated by the organization of his cognitive structure. It is unlikely that an individual whose cognitive structure pertaining to animals was so undifferentiated to be divided only into the categories "them what swims in the sea," "them what crawls on the ground," and "them what flies in the air" would have noticed any incongruity while watching the birds flying around the different islands of the Galapagos group that might later have spurred him on to formulate a theory of evolution of the species. On the other hand, Darwin, whose highly differentiated cognitive structure doubtless had numerous categories for birds alone and defined each of these categories by attention to such dimensions as shape of tail feathers, wing structure, and the shape of beak, did notice the differences in the beaks of the birds on the different islands and did eventually reduce the uncertainties this incongruity raised by formulating his theory of evolution. The greater differentiation of his cognitive structure than that of our "them what.." naturalist
made it more likely that he would notice this small incongruity when observing the birds during Cook's visit to the Galapagos Islands.

The third structural characteristic, integration of the subparts of the cognitive structure by their having in common one or more defining dimensions, also influences the probability of the individual's encountering optimal levels of incongruity in the environment. Remember that the upper limit of optimal incongruity is set by the difficulty of the change in the cognitive structure which must be made in order for the structure to become congruent with the environmental phenomena which have caused the incongruity in the first place. Any characteristic of the cognitive structure which decreases the difficulty of cognitive restructuring in response to a given stimulus situation will increase the likelihood that the incongruities present in that situation fall within the optimal range of incongruity. Greater integration of the cognitive structure can decrease the difficulty of cognitive restructuring by showing relationships between different categories which suggest their combining into more comprehensive new categories or suggest that important new dimensions be added to existing categories to differentiate them into more discrete categories. An example illustrating this point might be the reactions of two individuals with different degrees of integration of their cognitive structures upon encountering for the first
time a "funny mirror" or a mirror which distorts the reflections of objects in such a way as to make them appear much wider than they actually are.

Papu, a primitive tribesman living in New Guinea will serve as our example of an individual with a cognitive structure that has a very low level of integration. Papu's cognitive structure contains the category "mirror" as a result of his familiarity with the shaving mirror used by an anthropologist who once lived with the tribe. His cognitive structure also contains the category "eyeglasses" because he had tried on a pair of prescription sun-glasses belonging to the nearsighted anthropologist, the category "bubbles" because he had been given a bubble blower by the anthropologist, the category "pool of water" because he often drank from one near his village, and the category "reflection" which he had experienced in connection with both the mirror and the pool of water.

One day as Papu is hunting in the jungle he comes upon a full-length "funny mirror" propped up between two tree trunks. The image Papu sees in the mirror is that of an immense tribal warrior at least three feet across at the waist and four at the shoulders. Succumbing to his first instinct, Papu turns-tail and runs to hide behind the nearest tree, but a glance over his shoulder reveals that the huge warrior is fleeing in the opposite direction and is also looking back over his large shoulder at the fleeing Papu.
Papu stops. The fat warrior stops. Papu gets a puzzled look on his face. The fat warrior gets a puzzled look on his face. "Oh ho," thinks Papu, "a mirror!" The fat warrior gets an "Oh ho!" look on his face too. Papu hesitantly raises an arm. The fat warrior hesitantly raises his arm. Papu smiles and returns to the mirror pleased that he has figured out that the presence of the fat warrior is only his own reflection in a mirror. A shocked look suddenly appears on the face of the fat warrior. Papu has just realized that the huge reflection in the mirror means that he, Papy, has grown immensely fat! Had the witch doctor put a strange spell on that three-toed sloth Papu ate for breakfast? Papu and the fat warrior each reaches for his stomach. Papu looks down at his average-sized stomach, then at the huge belly of his reflection, then back down at his own stomach. "Hmmm," thinks Papu, "there is an incongruity between that portion of my cognitive structure pertaining to mirrors and the environmental phenomenon I have just encountered - namely, that my reflection in this mirror is much more obese than I." Papu thought back to the nearsighted anthropologist's mirror. No, it had not made Papu look any larger than he was. However hard he tried, Papu could remember no occasion when the anthropologist's mirror made anything appear larger than its true size. Because the only categories Papu was concerned with (i.e., the only categories in his cognitive structure which had high
accessibility) were the categories "mirror" and "reflection" and because he did not associate these with the categories "eyeglasses" and "pool of water", Papu's cognitive structure seemed to contain no clues as to the explanation of this strange mirror. Consequently Papu was uncertain as to the properties this mirror might have. Papu begins to become anxious. If this mirror has the power to make you appear to look fat, what other strange powers did it have? Papu's anxiety changes to outright fear. He turns and flees from the mirror. The fat warrior flees in the opposite direction.

Edith Ann, a thirteen year-old girl living in Indiana, will serve as our example of an individual with a cognitive structure that has a high level of integration. Edith Ann's cognitive structure contains the category "mirror" because she has several in her home. Her cognitive structure also contains the category "eyeglasses" because her older brother was nearsighted and wore glasses to correct this, the category "bubbles" because she had often blown soap bubbles, the category "pool of water" because she often played in an inflatable wading pool in her backyard, and the category "reflection" which she had experienced in connection with both the mirrors in her home and the wading pool in her backyard. One day Edith Ann goes to the county fair in Muncie and buys a ticket to the fun house. She goes giggling and screaming through its dark "Evil Passage," strangely slanted "Topsy-Turvy Room," down its "Roller-Coaster Slide," and finally
into its "Haunted Room." There Edith Ann comes upon her first "funny mirror." At first she thought the fat girl reflected in the mirror was her friend Gladys, but then Edith Ann notices that the fat girl seemed to be doing everything that Edith Ann did. Furthermore, the fat girl looked very much like Edith Ann - complete with pony tail and freckled nose. "Oh! A mirror," realized Edith Ann, "and that's my reflection. But I look so fat!" she went on to herself. "There must be something wrong with the mirror. It's just like putting on my brother's glasses and having everything look bigger and out of focus." But she wasn't wearing any eyeglasses and had never seen a mirror that made anyone look fat. Edith Ann begins to wonder what makes this mirror different - what made it stretch her reflection out of shape. Then she remembers that she had seen her reflection stretched out of shape before. While making ugly faces at herself in the undisturbed water of her wading pool one boring afternoon, the barette she was wearing in her hair had fallen into the pool causing a small splash and a series of ripples in the surface of the water. The rippled water reflected ugly faces back to Edith Ann that not only showed her contorted mouth, wrinkled nose, and squinting eyes, but also showed her whole face assuming weird shapes as the ripples on the water distorted her reflection. Edith Ann made one of her favorite ugly faces at the fat girl in the mirror who immediately returned the gesture in a fatter, shorter version. "There must be a connection," she thinks.
"Let's see, ripples in the wading pool water are like moving bumps." She looks carefully at the surface of the mirror. No bumps are apparent, only two fat blue eyes looking back into Edith Ann's. Edith Ann then tried to think of other places she had seen her reflection. "Oh yea, my brother's prescription sun-glasses! Everything in them looks curved, just like the things reflected in bubbles. That's it! Ripples in the pool, my brother's glasses, and the bubbles all had curved surfaces and they all make funny reflections. Ah ha! That mirror must be curved!"

Because Edith Ann had been concerned with the categories "mirror" and "reflection," and because the dimension "reflective surface" is common to the categories "pool of water," "eyeglasses," and "bubbles," Edith Ann eventually associated these separate categories of her cognitive structure with the most accessible category, "mirror," which was also partially defined by the category "reflective surface." She also noted for the first time that rippled pools of water, eyeglasses, and bubbles all had in common the dimensions "curved surface" and "distorted reflection." These relationships between the categories in her cognitive structure led Edith Ann to hypothesize that distorted reflections result from curved surfaces. In so doing, she added a new dimension to her category "mirror," i.e., the dimension "curvature of the reflecting surface." No doubt further exploration by Edith Ann would lead her to different-
tiate the category "mirror" into the sub-categories "flat mirror," "concave mirror," and "convex mirror."

All of this restructuring was within the capability of Edith Ann when she encountered the incongruity of a "funny mirror" because her cognitive structure was sufficiently integrated that the high accessibility of the categories "mirror" and "reflection" was eventually transferred to other categories having the dimension "reflective surface" in common with these first two categories. With high category accessibility for "rippled pools of water," "eyeglasses," and "bubbles" Edith Ann became more receptive to information having to do with these categories, especially information which fit into, and united, these diverse categories. The realization that objects in all these categories had curved reflecting surfaces which distorted reflections was just such a piece of information. That Papu could not make the appropriate changes in cognitive structure when he encountered a "funny mirror" (even though his cognitive structure contained the same categories as Edith Ann's) is due to the lack of sufficient integration in his cognitive structure to highlight important relationships between different categories. Low category accessibility in these other categories that were related to mirrors caused him to be unreceptive to information having to do with these other categories - information which was crucial to his being able to make appropriate changes in his cognitive structure. Edith
Ann successfully overcame the uncertainty she encountered and thereby escaped from the arousal, or anxiety, brought on by the uncertainty. Papu failed to overcome the uncertainty he encountered and therefore experienced not only anxiety, but also sufficient fear of the phenomena causing the uncertainty that he fled from its presence.

The point being made by this digression into a discussion of the relationship between characteristics of cognitive structure and the ability to make changes in the cognitive structure is that insufficient comprehensiveness, differentiation, and/or integration makes it likely that many individuals will encounter incongruities between the environment and their cognitive structures which they are unable to remove because the incongruity does not fall within the limits of optimal incongruity.\(^3\) Such an individual must then tolerate whatever level of anxiety accompanies the state of uncertainty caused by the incongruity or find some way other than cognitive restructuring to remove the incongruity. If the anxiety accompanying the state of uncertainty in which the individual finds himself is too great, the individual will find it uncomfortable and possibly intolerable. Herein lies the source of the need not to know and understand reality. When reality consists of

\(^3\)As noted later in this chapter, a cognitive structure may be characterized by too much integration to make cognitive restructuring likely.
an incongruity causing a great degree of uncertainty and concomitantly high levels of anxiety, the effective functioning of the individual may be best achieved by enabling the individual "to ward off threatening aspects of reality" as Rokeach phrased it. In the terminology being developed here, this "ward-off-threat" need can be filled by enabling the individual to avoid any information (from the environment or his own cognitive structure) which calls attention to incongruities between the environment and his cognitive structure which might cause him to experience excessive levels of anxiety. Thus, both of the functions of cognitive structures suggested by Rokeach have as their source the need to escape from the anxiety which accompanies uncertainty. The anxiety can be escaped by coming to understand the situation (achieved through cognitive restructuring), or, that avenue being closed, by a sort of "cognitive-hiding" from the situation.

Whichever of the two methods of dealing with uncertainty the individual chooses, his cognitive structure provides him with the means of carrying it out. If he chooses to attempt to overcome the uncertainty by gaining a better understanding of the environment, his cognitive structure can help him discover important information and reject unimportant information. This it does by controlling the individual's pattern of receptivity to information. Rules of category accessibility will be applied which are
aimed at making important categories of the cognitive structure highly accessible (e.g., categories having to do with reflective surfaces) while at the same time making less important categories inaccessible. If the individual chooses to ward off the anxiety caused by his failure to overcome the uncertainty, his cognitive structure can help him ignore, reject, or alter information which brings to mind the existence of the troublesome incongruity. Again, this is accomplished by controlling the individual's pattern of receptivity to information. Rules of category accessibility will be applied which make all categories having to do with the contradictory information inaccessible (e.g., categories having to do with reflections will have low category accessibility). In the case of choosing to attempt cognitive restructuring, the individual's pattern of receptivity is likely to be dominated by category accessibility rules intended to include particular kinds of information. In the case of choosing to close off awareness of the incongruity, the individual's pattern of receptivity is likely to be dominated by category accessibility rules intended to exclude particular kinds of information. In either case, the individual's pattern of receptivity can have a broad or narrow (or intermediate) scope of category accessibility.

Because of the negative connotation attached by Rokeach et al. and by Harvey, Hunt, and Schroder to becoming closed to information it is important to stress that closing out
information which leads to uncertainty is not necessarily "bad" or disfunctional. It is impossible for any individual to be able to understand all of the complex phenomena which he encounters daily in his environment; and it may be that the anxiety caused by his concern with not being able to understand some of these phenomena will seriously impair his ability to cope with more crucial aspects of his world.

It is even more important to stress that an individual may be adopting a pattern of receptivity that closes out much available information (i.e. adopting a pattern of focused receptivity) not to avoid information which leads to uncertainty, but instead to focus his attention only on information which will help him overcome the uncertainty by carrying out appropriate cognitive restructuring. In many instances the scope of a problem with which an individual is dealing may be such that efficient problem solving requires his focusing attention on only a narrow segment of information. In such cases, closing out much of the information from the environment becomes very functional. In fact, the ability to focus one's pattern of receptivity when it is called for is as important as being able to maintain a broad pattern of receptivity when that is called for.

Before leaving this discussion of the relationship between characteristics of cognitive structures, anxiety, and cognitive restructuring some additional points should be made. First, it should be noted that when cognitive re-
structuring is taking place the affected portions of the structure cannot be used by the individual to predict the occurrence of phenomena in the environment. When in the process of making changes in a portion of his cognitive structure, the individual is temporarily acknowledging the invalidity of that portion of the structure as an accurate representation of the environment. Consequently, he has no model upon which to base his predictions about the environment, and he must instead temporarily tolerate being in a state of uncertainty while the cognitive restructuring is taking place. The process of restructuring itself will therefore temporarily increase the amount of uncertainty facing the individual above the level of uncertainty caused by the originally perceived incongruity between the environment and his cognitive structure. It stands to reason that the larger the incongruity between the environment and the individual's cognitive structure, the larger the changes that will have to be made in the cognitive structure.

As the amount of restructuring becomes larger, the longer it will take and the greater the amount of uncertainty resulting from the restructuring process itself that will have to be tolerated by the individual. This relationship is important because individuals with a higher tolerance of uncertainty will be able to make larger structural changes than those individuals having a lower tolerance of uncertainty. In this manner, tolerance for uncertainty becomes another factor which
determines the upper limit of what constitutes optimal incongruity for a particular individual. The greater the tolerance for uncertainty possessed by an individual, the larger the amount of restructuring he can tolerate, and the greater the probability that he will encounter optimal levels of incongruity between the environment and his cognitive structure.

Related to this issue is another concomitant of restructuring. This is the fact that the individual's ability to predict environmental phenomena is not restored until he has had the opportunity to validate the changes made in his cognitive structure. He does this by using the newly restructured portions of his cognitive structure to make predictions about environmental phenomena and then he checks to see if his predictions are borne out. If they are, the structural changes are evaluated as being accurate cognitive representations of reality and congruency between the cognitive structure and the environment is assumed by the individual to have been restored.\(^4\) If the predictions are not borne out, congruency is assumed by the individual not to have been restored, further restructuring is necessary, and further uncertainty must be tolerated.

\(^4\)It should be noted that an individual could incorrectly perceive his environment because his pattern of receptivity excluded incongruent elements of the environment. This would lead the individual to believe he had made appropriate changes in cognitive structure when in fact he had not.
The ease with which these validations of structural changes can be made will influence the amount of uncertainty caused by the restructuring. If the validity of the changes is easily confirmed, for example, our Edith Ann can check her predictions about the relationships between the shapes of reflecting surfaces and the distortion of reflections in a variety of curved mirrors, an individual will not be in doubt about the validity of the new portions of his cognitive structure very long. By contrast, it may take a very long time for an individual to validate the cognitive changes he has made with regard to those sections of his cognitive structure dealing with morality or religion since predictions concerning the importance of a particular moral code or the powers of a deity may be very difficult to evaluate. The longer the time it takes the individual to validate to his satisfaction the structural changes he has made, the longer he must exist in a state of uncertainty and the greater the total amount of arousal he must tolerate. An individual with a history of success in overcoming uncertainty and consequently a greater tolerance for uncertainty may be able to devote long periods of time to validation attempts before he begins to experience undue anxiety. An individual with a history of failures in overcoming uncertainty and consequently a smaller tolerance for uncertainty may be able to devote only a short time to validation attempts before his anxiety level forces him to assume prematurely
that the changes made during cognitive restructuring are valid, to abandon them and return his cognitive structure to the state it was in prior to encountering the incongruity that fostered his attempts to make the changes in the first place, or to make additional changes in his cognitive structure.

It should also be noted that some portions of a cognitive structure are more "central" than others in the sense that large portions of the cognitive structure are related to them in such a way that changes in these central portions of the structure will require changes to be made in the related peripheral sections. It is this property of particular portions of a cognitive structure to which Harvey, Hunt, and Schroder (1961) were addressing themselves when they discussed the centrality-peripherality dimension of conceptual systems:

Centrality-peripherality refers to the degree of essentialness of a concept to the larger constellation of concepts, the total self-system or a subsystem of the self, which might or might not be the same. There are numerous ways in which centrality may be reflected. A conceptual linkage or subject-object relationship could be completely destroyed or severed, and its effects on other concepts and the larger system noted... manifestations of greater centrality that may be elicited by...refutation (or confirmation) include: higher affective arousal, either negative or positive; a more intense feeling of threat and anxiety in conditions portending violation to the directionality of the concept(s); heightened sensitivity and openness or receptivity
to those stimuli perceived as confirmatory; and increased closedness to negatively relevant objects. (1961, pp. 75-76)

Making changes in these central portions or categories of the cognitive structure necessarily causes more uncertainty than do changes in peripheral sections or categories. This is because these central parts of a structure, by definition, are integrated with large numbers of peripheral categories which will be affected by the restructuring. By involving larger portions of the cognitive structure in the restructuring effort, more of the environment becomes unpredictable and greater uncertainty for the individual results. A corollary to the notion that restructuring of central portions of a cognitive structure is more difficult is the possibility that increased integration (which we demonstrated earlier (pp. 119-126) can facilitate restructuring) may make cognitive restructuring more difficult. Such a notion would agree with the observation that the most significant discoveries of a scientist's career, that is, those that constitute major revisions of previously accepted theory, are made early in his career. He may make many significant extensions of this original discovery late in his career, but with the increasing complexity of interrelationships he builds up in that portion of his cognitive structure (i.e., with higher levels of integration), it is less likely that the scientist will change his basic point of view or approach enough to
favor his making discoveries which represent significant departures from the body of theory he has been building up during his career. To do so would require making changes in portions of his cognitive structure whose integration with many other sections would escalate the size of the cognitive restructuring undertaken very rapidly. This postulated relationship between level of integration and significance of discoveries would not be expected to apply in those many cases where the discovery is accidental, i.e., where the scientist is working toward clear aims, but makes a surprise discovery because he encounters a notable incongruity between the results of his efforts and the hypotheses he had been trying to validate.

An example of a highly central set of concepts or categories in an individual's cognitive structure might be those having to do with material possessions. If the individual defines these categories partially, but significantly, by the "good" portion of the dimension "good-bad," many of the individual's cognitive categories are going to be organized in such a way as to facilitate behaviors whose effect on the environment is to help the individual acquire material possessions. If the individual encounters information in the environment that suggests "goodness" is not the appropriate portion of the "good-bad" dimension which should define categories having to do with material possession, but instead indicates that it is the "bad" portion of the
dimension which appropriately defines these categories, then the individual has discovered a large incongruity between his cognitive structure and the environment. A reorganization of his cognitive structure to make it congruent with this new information would effect large portions of his structure and upset their functioning as a means of evaluating a broad range of environmental phenomena. Such a set of structural changes would have the potential for changing the individual's entire life style, e.g., from that of a wealthy industrialist to that of a property-less balladeer. Needless to say, the uncertainties raised by contemplating such a change would be immense and therefore the arousal created very great.

Also contributing to the immensity of the uncertainty and arousal accompanying the restructuring of highly central portions of a cognitive structure is the fact that the appropriateness of such changes, i.e., whether or not they have succeeded in restoring congruency between the cognitive structure and the environment, is often very difficult to validate. Thus the period of time during which uncertainty must be tolerated is often greater when central categories are involved in restructuring. All of these points about the property of centrality lead to the conclusion that restructuring of central portions of a cognitive structure is more difficult and therefore less likely to be attempted as a means of avoiding anxiety than is restructuring of
peripheral portions of a cognitive structure.

These considerations all point out that the amount of uncertainty caused by the restructuring process itself sets limits on an individual's ability to overcome uncertainty by cognitive restructuring. The difficulty of validating the structural changes, the centrality of the categories involved in the restructuring, and the individual's own tolerance for uncertainty join with the three structural characteristics discussed earlier (comprehensiveness, differentiation, and integration) in determining the probability that the individual will encounter optimal levels of incongruity which will lead to the growth of his cognitive structure. They also play a role in determining the patterns of receptivity a person is likely to adopt under different circumstances. It is this relationship between cognitive structure and receptivity-adaptability to which we now turn our attention.

**Cognitive structure and receptivity-adaptability.** We have characterized receptivity-adaptability as the ability of an individual to adopt and maintain patterns of receptivity to information which are appropriate to the different problem-solving situations he is likely to encounter. The extent to which an individual has this ability will be determined largely by the characteristics of his cognitive structure because these will set limits on his ability to adopt and maintain the widely varying patterns of receptivity required by the different situations he is likely to encounter. In order to
explain why this is the case it is necessary to recall some of the discussion presented in Chapter III. (see pp.77-80)

It will be remembered from Chapter III that patterns of receptivity can be characterized by attention to two different elements of the receptivity pattern. One of these elements is the scope of receptivity to information. It was described as being the range of categories in the cognitive structure with high accessibility. Thus, an individual could be said to have adopted, or a situation to require, a pattern of broad receptivity (i.e., many diverse categories having high accessibility) or perhaps a pattern of focused receptivity (i.e., only a narrow set of categories have high accessibility). The other element of a receptivity pattern was the type of rule governing which categories in the cognitive structure would have high or low accessibility. The types of category accessibility rules identified were: (1) content-orientation rules; (2) process-orientation rules; (3) source-orientation rules; and (4) belief- or attitudinal-valence rules. Thus, an individual could be said to have adopted, or a situation said to require, the application of certain rules, e.g., content-orientation rules intended to include specific types of information or perhaps source-orientation rules intended to exclude specific types of information.

If we presume that an individual will encounter, over time, a number of problem-solving situations requiring widely
varying patterns of receptivity, it follows that his receptivity-adaptability will be limited by his ability to adopt and maintain the appropriate receptivity patterns. Therefore, the individual will have to be capable of assuming and maintaining a broad scope of receptivity at times and a focused scope of receptivity at other times. Likewise, there will be some times when the individual will have to apply only certain types of rules (e.g., content- or process-orientation rules) to govern category accessibility rules and other times when he will have to apply other types of category rules (e.g., source-orientation or attitude-valence rules) to control the scope of his receptivity.

The comprehensiveness, differentiation, and integration of an individual's cognitive structure will influence his ability both to adopt and maintain the proper scope of receptivity and to apply the appropriate category accessibility rules. With respect to the scope of receptivity, comprehensiveness will set the limit on the breadth of the scope of receptivity an individual can adopt and maintain. The greater the range of categories in a structure, the broader the potential range of categories with high category accessibility. For example, a problem situation requiring attention to information falling into the categories "mirror," "reflection," "eyeglasses," "pool of water," and "bubbles" is a breadth of receptivity whose scope exceeds the comprehensiveness of the cognitive structure of a New Guinean whose
world has contained no mirrors, eyeglasses, or bubbles. In a similar fashion, effective urban planning requires attention to categories of information ranging from the technology of mass transit systems to sociological variables which determine the cohesiveness of a community and on to principles of aesthetics and architectural design necessary for creating living spaces that are both functional and aesthetically pleasing. An individual capable only of responding to information in the categories "politics" and "economics" will be unable to adopt and maintain a broad enough scope of receptivity to deal effectively with the problems of urban planning. 

Increased differentiation increases the breadth of an individual's scope of receptivity also. Differentiation increases the potential number of dimensions available for evaluating any phenomenon perceived in the environment or recalled from memory. If only a single dimension is used for classifying a stimulus, it will immediately be put in only one category, or, at most, one closely related set of categories. If a number of dimensions are used for classifying a stimulus, any category defined by one or more of these dimensions can potentially have high accessibility for an element of information contained in the phenomenon. Thus, one individual may evaluate political candidates according to the single dimension "dovish-hawkish" with respect to foreign policy. The only categories in this individual's cognitive
structure having high accessibility are those partially defined by the dimension "dovish-hawkish," e.g., the categories "candidates' positions on war in Southeast Asia," "candidates' positions on ABM systems," "candidates' positions on defense spending," etc. These categories represent the scope of his receptivity pattern regarding the foreign policy positions of all candidates. An individual with a more highly differentiated cognitive structure in the area of foreign policy might evaluate candidates on the dimensions "amount of military aid that will be given to dictatorships," "amount of economic aid given to dictatorships," "amount of trading that will be done with colonial powers and nations practicing apartheid," "amount of foreign aid that will be given to neutral, developing nations," "amount of trading that will be done with communist nations," "amount of tariff restrictions that will be placed on foreign imports," "desire to achieve at least partial nuclear disarmament," "willingness to use military pressure to prevent nationalization of U.S.-owned businesses abroad," "amount of support that will be given the United Nations and other supranational institutions," "willingness to cooperate with other nations on scientific and environmental problems," and "willingness to trade musk oxen for panda bears in the pursuit of international peace." The individual defining his cognitive categories pertaining to foreign policy by these eleven dimensions instead of the single "dovish-hawkish"
dimension can adopt a much broader scope of receptivity to information about candidates' foreign policy positions because any category partially defined by any of these dimensions would be likely to have high category accessibility.

Increased integration of cognitive structures increases the potential for adopting and maintaining broader scopes of receptivity by making possible the activation (i.e., the raising of the accessibility) of a number of categories by their having in common one or more defining dimensions. For example, our New Guinean friend, Papu, had a narrow scope of receptivity because the dimension "reflective surface" did not connect the categories "mirror," "eyeglasses," and "pool of water" with the result that the high category accessibility of "mirror" was not transferred to the other categories. Edith Ann had a broader scope of receptivity because the dimension "reflective surface" did connect all these categories with the result that the high category accessibility of "mirror," was transferred to the other categories.

If higher levels of structural development (i.e., comprehensiveness, differentiation, and integration) permit an individual to adopt broader scopes of receptivity, so too do they better enable him to adopt and maintain narrower, focused scopes of receptivity. Focused receptivity is attained by keeping the category accessibility of a few relevant cognitive categories higher than the accessibility of the many other less relevant categories of the cognitive structure.
The key in maintaining focused receptivity is continuity. If the higher accessibility of the few relevant categories drops below that of any other category, the individual's attention can be side-tracked to less relevant information causing him to miss important pieces of information belonging in the crucial categories with temporarily lowered accessibility. Focused receptivity therefore requires continuously higher accessibility in the relevant categories than in all other categories. Maintaining this continuously high accessibility is facilitated by the individual's receiving a constant flow of information which he perceives as useful in making progress toward achieving a match between his actual response and the optimal response for the situation in which he finds himself. In some cases this information will be of the sort useful for making predictions about environmental phenomena on the basis of his cognitive structure as it currently exists; at other times this information will be of the sort useful in the process of making appropriate changes in cognitive structure that will remove an incongruency between the individual's cognitive structure and the environment.

An example of this relationship between continuity of information flow into high accessibility categories to maintain a focused pattern of receptivity is given by the example of a boy who undertakes the building of a treehouse. His receptivity to information will be focused on those categories of information having to do with this activity only,
i.e., he will have high category accessibility for information regarding tree branch configurations, pieces of scrap wood, boxes of rusty nails in the barn, etc. while he will have low category accessibility for information regarding blossoms in the trees, birds in trees, old rubber tires in the barn, boxes of old shoes in the barn, etc. As long as there is information being assimilated into the "treehouse focus" categories of the boy's cognitive structure which permit him to predict successfully a sequence of interactions between his behaviors and the environment that bring him closer to achieving his goal of a tree-house, he will be able to maintain this focused pattern of receptivity. When, however, he runs out of long nails, returns to the barn to look for more, and finds none, the flow of useful information into the "treehouse focus" categories is interrupted. There are no longer stimuli in the environment whose assimilation into these high-accessibility categories will help the boy approximate his actual response to the optimal response, i.e., there are no longer any nails he can use for fastening the floor of the treehouse to the branches of the tree. His unsuccessful attempts to use shorter nails and then screws to attach the treehouse to the tree cause the boy to look for other similar fasteners. Failing to find any such objects, the accessibility of the "treehouse focus" categories may drop below the accessibility of other categories in the boy's cognitive structure, e.g., the category "old rubber tires."
If such becomes the case, the boy's pattern of receptivity will have lost its focus, perhaps only to gain a different focus, e.g., a focus on those categories having to do with making a swing out of the old rubber tire he noticed during his last trip to the barn to look for nails.

The necessity of maintaining continuously high accessibility in only the relevant categories applies also to less overt activities such as productive thinking. As long as an individual continues to be able to generate information stored in his cognitive structure or present in the environment which allows him to make progress toward his goal, category accessibility in the relevant categories will remain high enough to maintain the focused pattern of receptivity. The only thing likely to disrupt this focus is the interruption of this continuity or the appearance of some stimuli in such intensity that it raises the accessibility of some other unrelated category above the accessibility of the categories contained in the focus. 5 (see p.79)

Greater differentiation of the cognitive structure makes it more likely that the individual will receive a continuous flow of information into the categories included in the focus of his receptivity pattern. This is due to the fact that

5A special case of disruption of a focused pattern of receptivity is fatigue. Sufficient fatigue would constitute an intense stimulus capable of raising the individual's accessibility in such categories as "rest," "sleep," etc. until they are more accessible than the categories originally within the focus of the pattern of receptivity.
greater differentiation means that more dimensions, or aspects, of a stimulus situation will eventually be assimilated by the individual. For example, a man who divides the category "automobile engine" into the sub-categories "battery," "carburetor," and "main part of the engine" will run out of information as to why his car will not start as soon as he has determined that the battery is not dead, the car is not out of gas, the engine not flooded, and the "main part of the engine" not broken because "it seems to turn-over okay." A mechanic may divide the category "automobile engine" into the sub-categories "engine block," "fuel system," "lubrication system," "cooling system," and "ignition system" and it is probable that he would break each of these down into smaller categories (e.g., "ignition system" is broken down into the "primary system" and the "secondary system") and these smaller categories down into still more discrete sub-categories (e.g., the "primary system" is broken down into "battery," "ignition switch," distributor contact points," "condenser," "primary coil winding," and 'resistor'). As a consequence of his greater cognitive differentiation with respect to automobile engines, the mechanic's focus on the starting problem will include more dimensions for evaluating the problem with the result that he "can get more information out of the situation" and will be less likely to have exhausted
the flow of useful information before locating the source of
the problem, e.g., the contact points are badly burned.

Greater integration of the cognitive structure may also
facilitate an individual's efforts to maintain a focused
pattern of receptivity. Continuously high category accessi-
bility, remember, is dependent on the availability of informa-
tion which the individual can assimilate into his cognitive
structure for use in predicting what actual response will
match most closely the optimal response. If there is little
integration between sub-parts of a cognitive structure, the
individual may exhaust the supply of information included in
the narrow range of categories with high accessibility and
become side-tracked when their accessibility drops below that
of an irrelevant category. By contrast, greater integration
of these categories with other parts of the cognitive struc-
ture may result in the individual's noticing that one or more
other categories he had thought irrelevant to the problem have
an important dimension in common with the categories included
in the focus.6 When this occurs the individual can raise the
category accessibility of just these few relevant categories
and include them with the other high-accessibility categories
without disrupting the focus of the receptivity pattern. By

6Note that increased integration of the cognitive struc-
ture may also be detrimental to maintaining a focused pattern
of receptivity. This would be the case when relationships be-
tween categories cause the individual's attention to stray to
"related" but problem-irrelevant categories.
so doing he makes available a whole new set of information which may allow him to make successful predictions regarding what the optimal response in the situation is.

For an example of this, we can return to our treehouse builder who has temporarily shifted his attention to rubber-tire swings. When we left him he seemed to have exhausted the information in categories having to do with fastening the floor of his treehouse to the tree and was wandering through the barn looking for the materials to build a swing. Presuming he has a sufficiently integrated cognitive structure, his stumbling upon a box of U-bolts may rekindle his interest in (i.e., focus his receptivity) the task of completing his treehouse. This will be the case if his cognitive structure connects the categories "nails," "screws," and "bolts" by the common dimension "utility as a fastener" and results in the accessibility of the category "bolts" being raised by the boy's noticing the box of U-bolts. As he rummages through the box of U-bolts and through his memory, the boy recalls that U-bolts are often used for fastening things to cylindrical objects, e.g., a car's leaf springs to its axle. Eureka! Tree limbs and axles are both of the same shape so U-bolts may work as a means of fastening the treehouse to the tree. Unfortunately, the boy discovers that none of the U-bolts are large enough to fit around the tree limbs. But the category "bolts" still has high category accessibility and the boy decides to look for some long, straight bolts that he can
bend into sufficiently large U's to fit around the tree limbs. Blaah! No luck here either. The only bolts he finds which are long enough are also too hard for him to bend. Bend! Bendableness (pliability to those without fluency in treehouse builders' colloquialisms) is a dimension that connects the category "bolts" with another category, i.e., "baling wire." Not only is the category "baling wire" connected to the category bolts, but it is also connected to the categories "nails" and "screws" by its having in common with them the defining dimension "utility as a fastener."

His integrated cognitive structure serves the boy well. Baling wire is easily found around any old barn, can be bent around tree limbs easily, poked through nail holes made in the floor of the treehouse, the ends tied and then twisted to pull the wire tight, and the treehouse is complete. The boy was successful in regaining and maintaining a pattern of receptivity focused on treehouse building because his integrated cognitive structure facilitated the continuous flow of new information into those categories having to do with building treehouses and thereby kept their category accessibility from dropping below that of other categories.

A boy with the same cognitive categories as our successful treehouse builder, but lacking sufficient integration between them, would probably have run out of useful new information about fastening treehouses to trees as soon as he had run out of long nails. With no common dimensions providing
a ready connection between the category "nails" and any of the other potentially relevant categories of fasteners, this other boy would have access to no new sources of information on how to solve the problem. Consequently, the accessibility of the categories in his cognitive structure having to do with building treehouses would be likely to drop below the accessibility of other categories, and the boy's receptivity would lose its focus on the problems involved in treehouse construction.

Having seen how higher levels of structural development facilitate an individual's being able to adopt and maintain greater breadth or focus in the scope of his receptivity to information, we can now go on to investigate the way in which these same structural characteristics influence the individual's ability to apply category accessibility rules that are appropriate to the situations he encounters. High receptivity-adaptability requires that an individual not rely on the use of inappropriate types of rules to govern category accessibility, but the principles embodied in our conceptual framework for explaining the dynamics of cognitive functioning and their influence on receptivity-adaptability lead to the prediction that some individuals would have a tendency to rely on the use of source-orientation and/or attitude-valence rules at times when it may be inappropriate to the situation. Such would be the case when an individual with a cognitive structure characterized by a low level of structural development (i.e., low levels of comprehensiveness, differentiation,
and integration) encounters environmental situations causing him to experience excessive levels of uncertainty - levels that lead to his experiencing high anxiety.

The reasoning supporting such a conclusion takes us back to some points made earlier in this chapter (see pp.109-130) During this earlier discussion it was argued that an individual's tolerance for uncertainty in any situation (i.e., the extent to which he reacts to uncertainty by experiencing anxiety) is partially determined by the past success he has had in overcoming uncertainty in similar situations. It was argued that a low level of structural development lowered the probability of encountering optimal levels of incongruity between his cognitive structure and the environment; that this decreased his ability to make appropriate changes in cognitive structure to overcome uncertainty; that this led to his often failing to successfully overcome uncertainty (i.e., make accurate predictions about what behavior sequences would lead to favorable outcomes from his interactions with the environment); and that this in turn led to his experiencing anxiety when he encountered uncertainty.

An individual with a low tolerance for uncertainty will be motivated to escape from the concurrent state of anxiety as quickly as possible. If he does not readily perceive the appropriate changes he must make in his cognitive structure in order to remove the incongruity causing the state of uncertainty, another path open to him is to seek information from a source
which has consistently helped him out of uncertain situations before. Often this source, whether an ideology, single individual, or group or class of individuals, will constitute an authority figure for the anxiety-prone individual. Such an authority figure is obeyed because the individual has come to believe that the source possesses the most accurate available knowledge of the environment (i.e., the best ability to predict environmental phenomena) and therefore, the individual's failure to obey the authority figure is likely to lead to unanticipated and unfavorable outcomes from the individual's interactions with the environment. Whether a source is an authority figure or just a trusted source with regard to situations similar to that causing the uncertainty, the anxiety-prone individual is likely to apply a source-orientation rule to govern the category accessibility of his receptivity pattern, that is, his category accessibility will be governed by the dominance of rules to the effect that "those categories having to do with any information from this particular source will have high accessibility." If this source does not have a monopoly on the information relevant to the solution of the problem facing the individual, his reliance on that source-orientation rule will be inappropriate to the situation. In the case of the prejudiced individual as characterized by Adorno et al. and Rokeach et al. the inverse form of a source-orientation rule often governs the category accessibility of his receptivity pattern. By the inverse form, it is meant
that the rule is applied to exclude information emitted by certain sources as in a rule to the effect that "those categories having to do with information from radical, hippie freaks will have very low accessibility." The over-reliance on the use of either form of source-orientation rule will mean lower receptivity-adaptability for an individual since it hampers his using the most appropriate category accessibility rules for each situation he encounters.

Essentially the same argument can be made regarding the likelihood that an individual with a low level of cognitive development will exhibit an over-reliance on belief- or attitude-valence rules to govern category accessibility when he encounters uncertainty. Failing the ability to undertake the necessary cognitive restructuring, such an individual can mitigate the anxiety caused by the uncertainty by lowering his receptivity to any information which contradicts the beliefs and attitudes implicit in his cognitive structure (This would again be the inverse form of a rule since it is intended to exclude particular kinds of information.) and/or by raising the accessibility of only those categories having to do with information which supports his attitudes and beliefs. For example, in the unlikely case of an anxiety-prone Hindu mystic who is experiencing uncertainty because of the teachings of a Calvinist missionary, the likely defense against anxiety would be the adoption of a pattern of receptivity dominated by a belief-valence rule to the effect that "All categories
having to do with information which conflicts with the teachings of the ancient and holy Sanskrit writings upon which I base my beliefs will have very low category accessibility."

Again, the consequence of over-reliance on the use of a particular type of category accessibility rule--in this case a belief-valence rule--may be that the individual will be unable to adopt and maintain appropriate patterns of receptivity. He would therefore have low receptivity-adaptability.

**Situational characteristics and receptivity-adaptability.**

Great stress has been laid in our discussion upon the point that an individual's patterns of receptivity to information need to be adaptable to situational circumstances. The concept of an R-A profile was introduced as a means of characterizing the extent to which an individual is successful in making the adaptations necessary to achieve a match between his patterns of receptivity in differing situations and the patterns of receptivity which would be most appropriate to those different situations. We have just reviewed the ways in which the levels of comprehensiveness, differentiation, and integration of an individual's cognitive structure will influence his ability to adapt by adopting and maintaining appropriate patterns of receptivity, but we have not yet discussed how the characteristics of the situations themselves influence the likelihood of an individual's adopting one or another pattern of receptivity.

In Chapter III (pp. 80-82) we classified the character-
istics of situations into two categories: (1) those influencing the arousal level of the individual and (2) those influencing the complexity of the potential information input available to the individual. We will discuss first how the characteristics influencing the individual's arousal level interact with the characteristics of the individual's cognitive structure to influence the type of receptivity pattern the individual will adopt. The situational characteristics we have categorized as influencing the arousal level of an individual included:

1. time constraints placed upon behavior;
2. physical conditions contributing to the comfort or discomfort of the individual;
3. social, material, or physical rewards or punishments contingent upon the outcome of the situation;
4. the individual's involvement, investment, or interest in the situation; and
5. the individual's commitment to influencing the outcome of the situation.

Because it is difficult, and unnecessary for our purposes here, to make clear distinctions between these different situational characteristics, we have combined them all into the single variable arousal level. Our interest lies only in their potential influence on the patterns of receptivity different individuals will adopt. It is their contribution to determining the arousal level of an individual (as discussed in this chapter earlier, pp. 104-111) that is important
because arousal level is likely to be a major determinant of the receptivity patterns adopted by an individual in a particular situation.

The relationship between arousal and performance is apparently best described by an inverted, U-shaped curve,\(^7\) i.e., both extremely low and extremely high levels of arousal are detrimental to performance while moderate levels of arousal improve performance. Schroder, Driver, and Streufert (1967, pp. 67-105) have demonstrated that this relationship also apparently holds with respect to what they term "complexity of information processing," and the way in which they measure information processing complexity is similar in some important aspects to the way in which we have characterized patterns of receptivity to information. The five variables used by Schroder, Driver, and Streufert as measures of information processing complexity were:

1. the number of kinds of information tracked;
2. the number of ways information was combined;
3. the number of sources of information used;
4. the amount of discrepant information generated; and
5. the number of higher-level strategies developed.

---

Three of these variables can be interpreted as being characteristics of an individual's pattern of receptivity. The number of kinds of information tracked would be an indication of the individual's scope of receptivity (i.e. the range of categories having high accessibility) since the broader the scope of receptivity the greater the number of kinds of information to which the individual is receptive. The number of sources of information used would be an indication of the extent to which source-orientation rules were being used by the individual to limit the range of categories in his cognitive structure with high accessibility. And finally, the amount of discrepant information generated would be an indication of the scope of categories in the individual's cognitive structure from which information is drawn to supplement information available in the environment. If we extrapolate from the findings of Schroder, Driver, and Streufert on the basis of this similarity between their measure of information processing complexity and our concept of patterns of receptivity, we can conclude that the scope of an individual's receptivity patterns will bear an inverted, U-shaped relation to the arousal level of the individual.

Schroder et al. (1967, pp. 108-124) have also demonstrated that individuals and groups of individuals having cognitive structures with greater degrees of differentiation and integration will exhibit greater information processing complexity
than individuals or groups of individuals having less differentiated, less integrated structures. Though the difference is insignificant at extreme levels of arousal, the difference becomes very significant within the range of arousal levels that are most conducive to greater complexity of information processing. Again, if we extrapolate from the Schroder et al. findings we can reasonably conclude that the effects of arousal level upon scope of receptivity adopted by individuals with more developed cognitive structures will be different from the effects of arousal upon the scope of receptivity adopted by individuals with less developed cognitive structures.

In addition to similarities between their measures of information processing complexity and our concept of patterns of receptivity, these extrapolations from the findings of Schroder et al. can be justified by some logical deductions from our earlier discussion of the relationship between uncertainty and arousal level (see pp.106-111). In this discussion the point was made that an individual's desire to optimize the outcomes he receives as a result of his interactions with the environment constitutes his motivation to restore predictability to the environment. The size of the discrepancy between his Comparison Level for outcomes (CL) and his Comparison Level for alternatives (CL_{alt}) predicted by the individual to result from the disruption of his habitual behavior patterns determines the arousal level of the individual. Since the cause of the uncertainty will
be those elements of information in the environment which disrupt the congruity between the individual's cognitive structure and the environment, this arousal will be associated initially with these incongruent elements of information. Attempts to restore predictability will necessarily involve these primary categories (i.e., those categories directly related to the incongruent elements of the environment) and the individual will give these categories high accessibility, provided the individual eschews information avoidance strategies. In this manner arousal has the consequence of raising category accessibility in the categories most directly related to the incongruent stimulus elements (the primary categories). How high the accessibility of these primary categories will be raised will depend on the individual's arousal level (i.e., the size of the discrepancy between his CL and \(CL_{alt}\)). If the arousal is not too high, these primary categories may have an accessibility on a par with a large number of categories in the individual's cognitive structure and the pattern of receptivity adopted by the individual will have a relatively broad scope. If the arousal level is sufficiently high, these primary categories may acquire an accessibility which is much higher than all other categories in the individual's cognitive structure and the pattern of receptivity adopted by the individual will have a narrow, focused scope of receptivity. Thus, moderate levels of arousal would be expected to result in moderately broad
scopes of receptivity while higher levels of arousal would be expected to result in focused receptivity patterns. This deduction is consistent with our earlier extrapolation from the findings of Schroder et al. (see pp. 155-158).

This effect of increased arousal upon the scope of receptivity adopted would appear at first to be quite functional for the individual. It immediately focuses his attention upon those categories of information which have disrupted his ability to successfully predict environmental phenomena and to insure his receiving optimal outcomes from his interactions with the environment. With his attention focused on the categories related to the incongruity between the environment and his cognitive structure, the individual can begin to gather information which will allow him to make the appropriate changes in his structure and thereby restore congruity and predictability. But as we noted with regard to the problem of an individual's maintaining a focused receptivity pattern, successful cognitive restructuring may require broadening the scope of receptivity to include some categories which initially appear to have only secondary relevance to the problem of overcoming the uncertainty facing the individual. It will be recalled that our treehouse builder only solved his problems by raising the accessibility of a few additional key categories ("bolts" and "baling wire") thereby making himself more receptive to crucial elements of information which had previously fallen outside the focus of his receptivity pattern. Therefore, it is important to
note that arousal may have the effect of decreasing the scope of an individual's receptivity pattern to such a narrow focus that it becomes detrimental to his efforts at cognitive restructuring.

This detrimental effect of arousal can be mitigated by the influence of integration in the cognitive structure. Integration is the interconnection of parts of the cognitive structure by their having in common one or more defining dimensions. If arousal has raised the accessibility of a few primary categories (i.e., those directly related to the incongruent elements causing the uncertainty, and hence, the arousal), sufficient integration will result in the generalization, or transfer, of high category accessibility from these categories to important secondary categories related to the primary categories by important dimensions. The effect of this transfer of high category accessibility to other categories is to broaden the individual's scope of receptivity and to mitigate the focusing effect of the initial arousal. It can thus be argued that individuals with more integrated cognitive structures will adopt and maintain broader scopes of receptivity at a given level of arousal than individuals with less integrated structures. Again, our deduction agrees with our extrapolation from the findings of Schroder et al. (see pp. 158-160).

Negative arousal, or anxiety, may have an additional effect on the patterns of receptivity an individual adopts
in a particular situation. Overcoming a state of uncertainty requires cognitive restructuring by the individual to remove the incongruity between the environment and his cognitive structure. The process of cognitive restructuring itself creates additional uncertainty and anxiety for the individual that he must tolerate until the restructuring has been accomplished and its appropriateness validated (see pp. 129-133). But successful restructuring requires that a condition of optimal incongruity exist (see p. 115ff); and one of the determinants of the upper limit of what constitutes optimal incongruity for a particular individual is the amount of anxiety he can tolerate. If he can tolerate a certain level of anxiety, any conditions that contribute to the anxiety he experiences will decrease the reserve tolerance he has available. Should the anxiety produced by situational characteristics (i.e., factors contributing to the individual's arousal level) be too high, the individual will not have a sufficient reserve tolerance for anxiety to allow him to withstand the added uncertainty and anxiety caused by the restructuring process. An additional consequence of high negative arousal, then, is to decrease the individual's ability to successfully carry out necessary cognitive restructuring.

When the level of negative arousal - anxiety - experienced by an individual as a result of situational characteristics is high enough that it prevents the individual from attempting
cognitive restructuring, the individual must resort to some other means of escaping from the anxiety brought on by the state of uncertainty. The most likely are that he avoids those stimulus elements which are incongruent with his cognitive structure, distorts the incongruent elements in such a way that they no longer appear incongruent to him, or seeks out some source who can explain away the incongruity for him. In taking any of these escape routes from his anxiety, the individual will adopt a pattern of receptivity that differs significantly from a pattern intended to help him make appropriate changes in his cognitive structure. Instead of maintaining high category accessibility in the primary categories initially associated with arousal, the individual will apply category accessibility rules which make him least receptive to information which has brought about his state of uncertainty. Thus, he may adopt a belief-valence rule which lowers the accessibility of all categories having to do with information which contradicts the beliefs implicit in his present cognitive structure, adopt a content-orientation rule which lowers the accessibility of all categories whose content is concerned with the information associated with the incongruity which has led to his arousal, or adopt a source-orientation rule which raises accessibility in those categories having to do with information from sources which support, rather than contradict, his present beliefs, or finally, adopt a source-orientation rule which raises
accessibility in those categories having to do with information from a source he believes understands what he cannot (i.e., understands and can explain the apparent incongruity between the individual's cognitive structure and the environment) and whose advice will therefore protect him from receiving outcomes which are below his Comparison Level (CL). Each of these possibilities demonstrates that the effect of excessive levels of negative arousal will be the adopting by the individual of receptivity patterns dominated by category accessibility rules intended to protect the individual from experiencing further anxiety. It should also be noted that most such category accessibility rules are intended to exclude particular elements of information in contrast to rules intended to include particular elements of information. The former we have been calling inverse forms of rules.

As we noted when discussing the effects of structural characteristics upon the individual's tolerance of uncertainty (see pp.125-127), greater structural development increases the likelihood of an individual's having a higher tolerance for uncertainty, because such an individual is more likely to have successfully overcome past encounters with uncertainty by restructuring. Given this greater tolerance of uncertainty, the same situational characteristics which would result in a high level of arousal in an individual with a less developed cognitive structure may result in only a moderate level of arousal for the individual with a well developed structure.
Consequently, this latter individual will have a greater reserve of tolerance of anxiety which is available to help him withstand the uncertainty and anxiety that result from the process of restructuring. He therefore has a higher limit for what constitutes optimal incongruity and will have a greater ability to overcome uncertainty. This leads to the conclusion that individuals with different degrees of cognitive development will rely on different kinds of category accessibility rules even though the situational characteristics they face are similar. The individual with greater structural development will rely more on category accessibility rules that focus his receptivity on the information elements that are incongruent with his cognitive structure, whereas the individual with less structural development will, under the same situational characteristics, rely on rules that divert his attention from these incongruent elements of information.

We can summarize the effects of situational characteristics that contribute to arousal on receptivity patterns adopted by an individual as follows:

1. Situational characteristics that contribute to high levels of arousal tend to decrease the scope of receptivity adopted by an individual.

2. This effect is increasingly mitigated as the degree of cognitive development of the individual increases.

3. Situational characteristics that contribute to high levels of negative arousal tend to increase an individual's reliance on category accessibility
rules intended to protect the individual from experiencing further anxiety.

4. This effect is mitigated to the extent that the individual has a higher degree of cognitive development which decreases the negative arousal he is likely to experience when in a state of uncertainty.

We turn now to how the second category of situational factors - those contributing to the complexity of the potential information input to the individual - influencing the patterns of receptivity individuals are likely to adopt. As was the case in our treatment of situational factors influencing an individual's arousal level, we will combine all of the factors which contribute to complexity into the single variable information input complexity. However, it is helpful to identify the six or so factors that we will include in the variable complexity and to stress that a more sophisticated treatment than is possible in this dissertation would investigate both the qualitative and quantitative differences each of these factors has on the patterns of receptivity individuals are likely to adopt. The first of these factors is the extent to which the information present in the situation is static (i.e., continuously available over time) or changing (i.e., present in the environment only parts at a time in some sort of temporal sequence). The greater the changeability of the information, the more complex the problems of combining separate elements of information becomes
because the individual does not always have direct access to all the information and must combine different elements of information from different time periods with the risk that his memory of them may not always be accurate. The number of sources from which the information comes is a second factor which influences the complexity of a situation. The greater the number of sources, the greater the complexity because information about the source as well as the information emitted from the source must be considered by the individual. A third factor is the size of the incongruity between the information available in the environment and the individual's cognitive structure (i.e., the novelty vs. familiarity of the information). A fourth factor is the intricacy of the relationships between the elements of information. The more intricate the relationships, the more difficult and complex is the job of discovering them and including them in the cognitive restructuring that may be necessary to overcome uncertainty. Also complicating information inputs to the individual will be the pattern of stimulus intensity present in the situation. If the pattern of stimulus intensity is relatively simple and calls attention to appropriate categories of stimuli (e.g., a lion's roar calls attention to the most immediate problem facing the individual hearing it, gives the approximate location of danger, and raises accessibility in those categories of the cognitive structure having to do with escape), the processing of information will be simpler
than if a more complex pattern of stimulus intensity fails to aid, or perhaps even hinders, the individual's giving attention to the appropriate elements of information. For example, the problem of discovering "who done it?" in an old Perry Mason episode is often complicated for the viewer by his attention being drawn to misleading clues presented in dramatic episodes, while the more clever Perry Mason discovers the critical pieces of evidence by giving attention to small details whose presentation is accompanied by little intensity and which go unnoticed until Mason draws attention to them in the courtroom or during the epilogue. Finally, the size of the information load upon the individual will also be a factor in determining the information input complexity of the situation. Information load can be of at least three types:

1. the number of elements of information present in the situation which must be combined correctly to allow the individual to make appropriate changes in his cognitive structure;

2. the amount of information the individual must generate from his cognitive structure to supplement the information present in the environment; and

3. the number of elements of irrelevant or inconsequential information which must be rejected or ignored by the individual in his attempt to identify the crucial elements of information.

The greater the information load present in any of these three forms, the more complex the situation for the individual.
In exploring the influence of these factors which contribute to complexity of information input, we can again begin with work done by Schroder, Driver, and Streufert (1967) on human information processing. In their investigation of the effects of environmental complexity (defined as the number of dimensions of information presented in a time span, the diversity of information, and the number of alternatives each unit of information adds) Schroder et al. (1967, pp. 54-66) again discovered that an inverted U-shaped curve best described the relationship between complexity of the environment and complexity of information processing. As in our discussion of the effects of arousal on patterns of receptivity, we will again assume it legitimate to generalize from the Schroder et al. findings regarding information processing complexity to patterns of receptivity to information. In this case we will presume that their findings suggest an inverted, U-shaped relationship between input complexity (produced by any combination of the six factors just identified above) and the breadth of the scope of receptivity adopted by individuals in general. Thus, we would expect low levels of complexity to result in focused patterns of receptivity, moderate levels of complexity to lead to broader scopes of receptivity, and excessively high levels of complexity to lead to highly focused patterns of receptivity. Once again these assumptions can be supported by logical deduction from the conceptual framework we have developed up to this point.
The practical effect of increases in any of the situational variables contributing to complexity is to increase the number of stimulus elements potentially contributing to the incongruity between the environment and an individual's cognitive structure. For the reasons discussed earlier (see pp. 156-158), each of the incongruent elements will initially be associated with whatever arousal the individual experiences, and this arousal leads to higher category accessibility in those categories associated with the incongruent elements. Thus, an increase in the number of incongruent elements, which results from increased complexity, leads to high accessibility in more categories - that is, increased complexity leads to a broader scope of receptivity.

For example, the hero of an Italian-made western, who is being held in the Taco-Tio Junction jail and is facing the prospect of being hanged next week when the circuit judge comes to Taco-Tio Junction to hear his case and sentence him, is faced with a relatively uncomplicated situation. If he is to avoid putting in an appearance at the hanging, he must escape from the one-room jail in which he is being held. The information available to the hero-prisoner is that there is one barred-window in the jail cell which looks out on the alley behind a Chinese restaurant, there is a not-too-bright deputy in the next room who brings him his meals and spends most of the rest of his time sleeping with his feet on the desk, the stable is next door to the jail (if the hero's sense of smell is
accurate), most of the town takes a siesta every day between 1:00 and 3:00 in the afternoon, and finally, the key to the jail cell is left on top of the deputy's desk. Given this relatively uncomplex situation, the hero-prisoner is likely to have a relatively narrow scope of receptivity which includes a focus on ways in which he might either escape through the barred-window or get possession of the key to the cell door. With either of these accomplished, the hero-prisoner could then go to the stable between 1:00 and 3:00, steal a horse, and make his escape on horseback by following the dry river bed which runs behind the Chinese restaurant.

In contrast, the hero of a Japanese version of a James Bond-style adventure is faced with a more complex situation. He is being held prisoner in an Eastern-Bloc prison that features computer controlled cell-door locks, electrified grills as the floors in all of the cell-block corridors, alarms triggered by photo-electric cells on all the doorways leading from the cell-blocks, armed robot guards patrolling the prison building and programmed to attack anything which moves unprotected by a special tellurium badge, and so on almost ad infinitum. With all of this information available to the amazing hero, he is likely to have a broad scope of receptivity which includes high accessibility in the many categories having to do with overcoming the immense complexity of obstacles to his escape. This is presuming that the level of input complexity has not become so excessive as to begin to
decrease the scope of his receptivity.

Such a point is reached when the complexity of the situation results in such a large incongruity between the individual's cognitive structure and the environment that cognitive restructuring is so difficult as to preclude its being an available means of escaping the anxiety the individual is experiencing in the situation. When this point has been reached, the function of the cognitive structure switches from helping the individual to understand the environment to the function of helping to protect him from its threatening aspects, in this case excessive anxiety. This is achieved by adopting a pattern of receptivity which protects the individual from further exposure to the information which has given rise to his uncertainty, and hence, to his anxiety (see pp. 125-129). Having reached this level of complexity, further increases in input complexity will have the effect of narrowing the scope of receptivity adopted by the individual as the accessibility of more and more categories is lowered to protect him from incongruent elements of information. These conclusions agree with the findings of Schroder et al. that complexity at first increases the complexity of information processing until an optimal level of complexity is reached and then further complexity will cause decreases in information processing complexity.

The level of input complexity will also affect an individual's patterns of receptivity in terms of the category accessibility rules he uses to govern his receptivity. Up
to the point where increasing complexity first begins to have the effect of decreasing the scope of his receptivity, it is likely that the individual will have relied largely upon content-orientation and approach-orientation rules to govern his category accessibility. It is also likely that any rules, regardless of which of the four types, will be used primarily with the intention of including (receiving) certain kinds of information in the cognitive structure for the purpose of helping in the restructuring process. Once this point of optimal complexity has been passed, it is more likely that the individual's pattern of receptivity will be dominated by source-orientation and attitude-valence rules; and it is also likely that, whatever types of rules are used to govern category accessibility, they will be primarily intended to exclude certain kinds of information from the individual's awareness to protect him from experiencing anxiety. These relationships between complexity and the scope of receptivity and the types of category accessibility rules dominating the individual's pattern of receptivity are depicted in Figure 4.1.

As in the case of their investigation of the effects of arousal on information processing complexity, Schroeder et al. found that individuals and groups of individuals whose conceptual systems (i.e., cognitive structures) were characterized by greater differentiation and integration reached optimal levels of information processing complexity at higher levels of environmental complexity than individuals with cognitive
FIGURE 4.1

THE EFFECTS OF INFORMATION INPUT COMPLEXITY UPON PATTERNS OF RECEPiVITY LIKELY TO BE ADOPTED BY AN INDIVIDUAL

structures which were less differentiated and less integrated (Schroder et al. pp. 108-124). And once again we will hypothesize that this same relationship is likely to hold between the degree of cognitive development and the scopes of receptivity adopted by an individual. The more developed (i.e., the more comprehensive, differentiated, and integrated) an individual's cognitive structure, the higher the level of input complexity he can handle before his receptivity patterns will begin to assume narrower, and narrower scope. This conclusion can be supported by the argument that for individuals
with more developed cognitive structures, a higher level of complexity will have to be reached before the size of the incongruity between structure and environment exceeds the range of optimal incongruity for these individuals. They are able to handle a higher level of complexity by cognitive restructuring than the individuals with less developed cognitive structures (see pp. 115-129). At this same level of complexity, the latter individuals will find that their optimal levels of input complexity have been exceeded and that the incongruity between structure and environment has been exceeded with the result that successful cognitive restructuring becomes unlikely. The only recourse left to such an individual at this level of complexity is to adopt a pattern of receptivity that minimizes his exposure to the incongruent elements of information in the situation that caused him to experience uncertainty and anxiety. By the same token, this difference between levels of cognitive development and its effect on determining optimal levels of input complexity for the two types of individuals also explains why at the same level of environmental complexity the less cognitively developed individual will adopt a narrow scope of receptivity which is characterized by the dominant use of source-orientation and attitude-valence rules intended to exclude specific kinds of information while the more cognitively developed individual will have adopted a broader scope of receptivity characterized by the dominance of content-orientation and approach- or process-orientation
rules intended to include specific kinds of information.

In closing this discussion of the effects of situational characteristics on the patterns of receptivity adopted by individuals in general and the mitigation of these effects by higher levels of cognitive development, it is important to stress two points. First, though the discussion has been phrased in terms of total cognitive structures, it is most probable that levels of development of different sub-parts of a single individual's cognitive structure will vary greatly. For example, with respect to politics, an individual's cognitive structure may be characterized by a high degree of comprehensiveness, differentiation, and integration while with respect to aesthetics in art and architecture, his cognitive structure may be characterized by very low degrees of comprehensiveness, differentiation, and integration.

Second, a broader scope of receptivity need not be "better" than a narrow scope of receptivity judged in terms of their helping the individual cope effectively with a situation. It is very conceivable that a situation characterized by high input complexity requires attention only to a small amount of the total available information, or perhaps, attention only to information being emitted by one of a large number of sources. In a case such as this, a broad scope of receptivity may handicap an individual by causing him to divide his attention among both relevant and irrelevant elements of information. It is therefore possible that some situations will favor better performance by individuals with
less developed, rather than more developed, cognitive structures.

With this last point we have reached the end of the development of the conceptual framework being offered as an explanation of why individuals may differ in their ability to match their patterns of receptivity to the requirements of different problem-solving situations. We move on now to a discussion of how some of the assumptions and hypotheses included in this conceptual framework could be studied and to a description of a first minor attempt to investigate receptivity-adaptability.
In Chapter IV we developed a conceptual framework for explaining why individuals might vary with respect to their receptivity-adaptability. The purpose of developing this conceptual framework was to provide us with some sort of a logically conceived outline for investigating individual differences in receptivity to information that influence problem-solving ability, especially problem-solving that involves utilization of information from social sources (see discussion in Chapter I, pp.4-6). As mentioned in Chapter I, the empirical problems investigated in this dissertation constitute only a first step on the way to a full-scale investigation of individual differences in receptivity-adaptability, but it is appropriate here to give an indication of what some of the components of that large-scale investigation would be.

A Larger Scale Investigation of Receptivity-Adaptability

First of all, presuming that receptivity-adaptability proves to be a useful heuristic concept, the ultimate goal of a full-scale empirical undertaking would be the identification of variables which are the sources of differences in R-A among individuals and which also might be susceptible to control.
by educators working to improve students' problem-solving skills. Obviously, an important step in reaching this goal would be the development of a reliable instrument for characterizing an individual's R-A profile. The format such an instrument might take was described earlier (see pp. 73-91), but before it could be constructed several sub-tasks would have to be completed. These include:

1. developing a means of measuring the scope of receptivity adopted by the individual (see pp.74-75);

2. developing a means of identifying the dominance of particular forms of category accessibility rules over the pattern of receptivity adopted by the individual (see pp.78-80);

3. developing a means of manipulating the amount and type (positive, negative, or ambivalent) of arousal experienced by the individual in particular situations in which his receptivity patterns are being recorded (see pp.107-110);

4. developing a means of manipulating the amount and type of information input complexity experienced by the individual in particular situations in which his receptivity patterns are being recorded (see pp.165-168); and

5. developing a means of determining what an appropriate pattern of receptivity is for each of the particular situations in which the individual's receptivity patterns are being recorded (see pp.82-91).

If these tasks were successfully completed and if an instrument for characterizing an individual's R-A profile were developed, the study could then proceed with the investigation of several major hypotheses suggested by the conceptual framework. These hypotheses are given in Figure 5.1 below.
TABLE 5.1

MAJOR HYPOTHESES REGARDING RECEPIVITY-ADAPTABILITY

1. Receptivity-adaptability increases as the cognitive complexity (i.e., the comprehensiveness, differentiation, and integration) of salient portions of the individual's cognitive structure increases.
   a. Scope of receptivity is capable of greater variation as cognitive complexity increases;
   b. Dominance of source-orientation and attitude-valence rules decreases as cognitive complexity increases.

2. An individual's choice of receptivity patterns when he/she encounters an incongruity between his/her cognitive structure and the environment will be influenced by whether the individual is engaged in attempts to escape the uncertainty by avoiding the information (stimuli) calling attention to the incongruity.

3. A focused pattern of receptivity can be maintained only if there is a reasonably continuous supply of "helpful" information available.

4. An individual's scope of receptivity is influenced by the amount of arousal he/she is experiencing, and in general, this effect is best described by a bell-curve with arousal level plotted along the ordinate and scope of receptivity plotted along the abscissa.

5. The effect of greater cognitive complexity upon the relationship described in Hypothesis 4 is to move the shape of the function away from a bell-curve toward an inverted, U-shaped curve, that is, increased cognitive complexity mitigates the effect of arousal upon scope of receptivity.

6. An individual's receptivity pattern will be increasingly dominated by source-orientation and attitude-valence rules as his arousal level approaches extremely high or extremely low levels.

7. As an individual's cognitive complexity increases, the effect of extreme levels of arousal upon the dominance of source-orientation and attitude-valence rules over his/her receptivity pattern is mitigated.
8. An individual's scope of receptivity is influenced by the information input complexity characterizing the situation, and in general, this effect is best described by a bell-curve with information input complexity plotted along the ordinate and scope of receptivity plotted along the abscissa.

9. The effect of greater cognitive complexity upon the relationship described in Hypothesis 8 is to move the shape of the function away from a bell-curve toward an inverted, U-shaped curve, that is, increased cognitive complexity mitigates the effect of information input complexity upon scope of receptivity.

10. Extreme levels of information input complexity (i.e., very low or very high) cause an increase in the dominance of source-orientation and attitude-valence rules over an individual's receptivity pattern.

11. As an individual's cognitive complexity increases, the effect of extreme levels of information input complexity upon the dominance of source-orientation and attitude-valence rules over his receptivity patterns is mitigated.

It is worth noting a second time that any investigation of the relationship between receptivity-adaptability and the complexity of cognitive structures must take into account the likelihood that the degrees of comprehensiveness, differentiation, and integration of different sub-parts of a single individual's cognitive structure will vary greatly.\(^1\)

\(^1\) Schroder, Driver, and Streufert (1967) hypothesize that this is the case, and Vannoy (1965), in a comprehensive factorial analysis of 20 instruments which purported or could be construed as measuring cognitive complexity, did not find evidence that the instruments measured a common, general trait that could be considered cognitive complexity. Vannoy concluded that a number of factors contributed to the complexity of an individual's interactions with his environment.
The implication of this possibility is that cognitive complexity would have to be dealt with as a content-specific variable and measured by a battery of cognitive complexity tests rather than by any single instrument. In addition, it is important to entertain the possibility that cognitive complexity is a multi-dimensional, rather than a uni-dimensional, variable. For, although it is probable that the three characteristics of cognitive structure-comprehensiveness, differentiation, and integration - are interrelated (see pp. 72-73), it may be the case that attention to each of the characteristics separately is the only satisfactory way of characterizing an individual's cognitive complexity.

If a full-scale empirical investigation of the conceptual framework presented in Chapter IV were undertaken, it would be important to investigate not only the major hypotheses given in Figure 5.1, but also to devote a sizeable amount of effort to some important subsidiary hypotheses. These have to do with the relationships among uncertainty, cognitive re-structuring, and arousal (see pp. 101-137). These hypotheses are presented in Table 5.2.

Once again considerable care and effort would have to go into the development of the instrumentation to test for tolerance of uncertainty, type and level of arousal, and the extent of the incongruity between a perceived set of stimuli and the appropriate sub-parts of an individual's cognitive structure.
TABLE 5.2

SUBSIDIARY HYPOTHESES RELATED TO RECEPTIVITY-ADAPTABILITY

12. A perceived incongruity between an individual's cognitive structure and his environment places him in a position of uncertainty regarding potential occurrences in his environment and this exposure to uncertainty causes him to experience arousal.

a. Uncertainty associated with circumstances the individual predicts will eventually give him outcomes above those he is accustomed to receiving (i.e., he predicts his $CL_{alt}$ is higher than his CL) causes him to experience positive arousal. (Excitement hypothesis.)

b. Uncertainty associated with circumstances the individual predicts will eventually give him outcomes below his CL (comparison level) will cause him to experience negative arousal. (Anxiety hypothesis.)

c. Uncertainty associated with circumstances the individual predicts will eventually give him outcomes either above or below his CL causes him to experience ambivalent arousal. (Thrill hypothesis.)

13. The pattern of receptivity adopted by an individual will change in the direction of decreased receptivity to information concerning uncertainty as that individual becomes convinced that his condition of uncertainty will persist unless the circumstances giving rise to it can be avoided.

14. Cognitive restructuring takes place only when an individual encounters an optimal incongruity between his cognitive structure and environmental or internally generated information.

15. The greater the amount of restructuring necessary to overcome uncertainty (i.e. the greater the perceived incongruity), the greater the extent of the uncertainty and consequent arousal experienced by the individual attempting the cognitive restructuring.

16. The greater an individual's tolerance of uncertainty, the greater the size of incongruities falling within the range of optimal incongruity (i.e. the larger the size of cognitive restructuring he can attempt without experiencing excessive levels of arousal).
The Study

Within the scope of the investigation undertaken for the empirical portion of this dissertation were some more limited goals intended to indicate the potential fruitfulness of large-scale research efforts. One such goal was to discover if people change their patterns of receptivity to information as the problem situations they face change. The answer to this very basic question would give some clue as to whether or not it is useful to think in terms of receptivity-adaptability as a human trait.

In the conceptual framework two categories of variables which influence problem-solving situations were identified: (1) those variables which contribute to the potential information input complexity of the situation and (2) those variables which contribute to the potential arousal level of an individual in the situation. In this experiment only one element (the problem's scope, e.g. whether its scope includes only legal issues or also moral, social, and environmental issues) in the first category was manipulated in the two problem situations subjects faced. In one of the problems only two elements (time-potentially-available and money-potentially-available) which contribute to arousal level were manipulated and in the other problem situation only one variable from this category (time-potentially-available) was manipulated. Thus, the manipulation of problem situation conditions to achieve
the first goal of this research effort was very limited and crude compared to that called for in a full-blown investigation of this aspect of the conceptual framework.

A second goal of the research was to see if the postulated relationship between receptivity and cognitive complexity is strong enough to show up even though the instrument used to measure cognitive complexity presumes that it is a general, uni-dimensional trait rather than a content-specific and multi-dimensional one as conceived in the conceptual framework. If this were to be the case, less effort would have to be directed toward developing a battery of content-specific tests of cognitive complexity than if this relationship is not manifested using this already existing version of an instrument measuring cognitive complexity.

The third goal of the research was similar to the one just mentioned. It was to see if any preliminary support for the existence of a relationship between receptivity-adaptability and tolerance of uncertainty could be found using a test of intolerance of ambiguity as the measure of tolerance of uncertainty. If such evidence were found it would be a first step in the investigation of some of the subsidiary hypotheses presented in Table 5.2.

Hypotheses. The specific hypotheses tested in association with the above goals were:

Hypothesis A: As the scope of the problem diminishes, the scope of receptivity adopted by an in-
Hypothesis B: As the available completion time and/or available money diminish, the scope of receptivity adopted by an individual will decrease.

Hypothesis C: Intolerance of uncertainty as measured by the Budner Intolerance of Ambiguity Test is inversely related to intra-subject variation in scope of receptivity across problem conditions.

Hypothesis D: Cognitive complexity as measured by the Bieri Test of Cognitive Complexity is directly related to intra-subject variation in scope of receptivity across problem conditions.

It should be noted that the above hypotheses are formulated only in terms of scope of receptivity to information (i.e., the range of categories with high accessibility) and not in terms of patterns of receptivity to information. The decision was made to postpone studying the dominance of particular forms of category accessibility rules in this study when it became apparent that developing a reliable and accurate means of identifying such category rule dominance would greatly complicate both instrumentation procedures and data analysis.

Subjects and experimental design. The subjects used in the experiment were sixty-four male and female college students enrolled in the ubiquitous introductory psychology course. Each subject's scope of receptivity was measured under four conditions in each of two different problem situations. Their scores were then analyzed to determine if there were significant changes in scope of receptivity across the four conditions.
and to find if there were any relationships between a subject's variation in scope of receptivity across conditions and his/her scores on a test of intolerance of ambiguity and on a test of cognitive complexity.

The experiment was set up as two separate analyses of variance designs each with one between-subject and two within-subject variables. A subject's scores on the Budner (1962) Intolerance of Ambiguity Test was the between-subjects variable in the first analysis of variance and the scores on the Bieri (1955) Cognitive Complexity test the between-subjects variable in the second analysis of variance. In both cases the between-subjects variable had two levels arrived at by a median-split of the subjects into equal groups of high and low scoring subjects.

The two within-subject variables were problem scope and time/money potentially available in both of the analyses of variance. Each of these two variables also had two levels yielding four conditions for each problem situation:

Condition 1 -- Broad Problem Scope, Ample Time/Money
Condition 2 -- Broad Problem Scope, Limited Time/Money
Condition 3 -- Narrow Problem Scope, Ample Time/Money
Condition 4 -- Narrow Problem Scope, Limited Time/Money

The experimental design resulting from this arrangement of between-subject and within-subject variables is represented
in Table 5.3 below. In this table, 'A' and 'C' are Insensitivity of Ambiguity and Cognitive Complexity respectively, 'P' is problem scope and 'T' is time/money available.

TABLE 5.3

THE EXPERIMENTAL DESIGN

<table>
<thead>
<tr>
<th>Analysis of Variance 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ P_1 ] P_2 ]</td>
</tr>
<tr>
<td>T_1 T_2 T_1 T_2</td>
</tr>
<tr>
<td>Y_1 \cdot 1 \cdot 1</td>
</tr>
<tr>
<td>A_1 S_1 S_32</td>
</tr>
<tr>
<td>\vdots \vdots</td>
</tr>
<tr>
<td>A_2 S_33 S_64</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analysis of Variance 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_1 S_1 S_32</td>
</tr>
<tr>
<td>\vdots \vdots</td>
</tr>
<tr>
<td>C_2 S_33 S_64</td>
</tr>
<tr>
<td>[ Y_{64 \cdot 2 \cdot 2 \cdot 2} ]</td>
</tr>
</tbody>
</table>

Procedure. Subjects were given a test packet consisting of written directions, eight hypothetical problem situations, and two electronically-scored answer sheets. (See
Appendix for copies of the test instruments.) Subjects were then directed by the experimenter to print their names, class year, and sex on the answer sheets in the appropriate spaces and given directions on how to mark their answers for the three separate parts of the experiment. They were then told that each part of the experiment should be completed taking as much time as needed before obtaining the next part of the experiment. This procedure was to be followed until all three parts of the experiment had been completed and turned in to the experimenter. Subjects, after being given an opportunity to ask clarifying questions about the above directives, were instructed to begin working on Part I after reading the written directions that accompanied it. The subjects each completed the three parts of the experiment in order, turned the tests and answer sheets in, were given a brief, written explanation of the purpose of the experiment, and allowed to leave.

Measuring Instruments. The first part of the experiment containing the eight hypothetical problems actually consisted of the four conditions identified above for each of two problem situations. The basic format of the instrument consisted of a written description of a hypothetical problem situation and an accompanying list of several elements of information potentially available to the problem-solver. Each of the two problem situations was written in four variations intended to require changes in scope of receptivity appropriate to efficient solution of the problem. For the purpose of the study,
receptivity was defined as an individual's "taking into consideration" a particular element of information on the list accompanying the problem situations. This definition is an attempt to make a distinction between receptivity and perception, which implies only having a sensory awareness of a stimulus, and also to make a distinction between receptivity and persuasion, which implies acceptance of the value communicated in an element of information.

In actually working through the two problem situations, each subject read the description of the problem situation for that condition, rated each of the twenty accompanying information items as critical, important, relevant, possibly relevant, or irrelevant to solution of the problem under that condition, and repeated this procedure until all four conditions of the two problem situations were completed. In the case of the first problem situation, the "abortion problem," the twenty information items were designed to fit into six categories (religious, socio-economic, psychological, environmental, legal, and political) of which only the fifth (legal) was designed to be of salient importance in the "narrow scope" conditions. In the case of the second problem situation, the "transportation problem," the twenty items were designed to fit into four categories (cost, passenger utilization, environmental-aesthetic, and sociological) of which only the second (passenger utilization) was designed to be of salient importance to solution of the problem in the "narrow scope"
conditions.

These two problem situations with their twenty information items were chosen from four situations accompanied by from forty to sixty-five information items each. A pre-test and item analysis of these led to the selection of the problem situations and information items used in the experiment. The first of the additional instruments completed by subjects was the Vannoy (1965) modification of the Bieri (1955) test of Cognitive complexity (which itself is a modification of Kelly's (1955) Role Construct Repertory Test). The Bieri test is based on Kelly's theoretical formulations regarding the existence of personal constructs in each individual. An individual's system of constructs was hypothesized to function as the structure through which an individual perceived his environment and is thus akin to the concept of cognitive structure presented in Chapter III. Bieri conceived of cognitive complexity as the degree of differentiation in an individual's construct system and designed the test of cognitive complexity to measure the extent to which persons used more or fewer distinct dimensions to describe persons in their lives. Presumably, the more similarity among descriptions of different persons by an individual, the less distinct the dimensions being used and the less differentiated his construct system.

The Bieri test was selected as the measure of cognitive complexity in this study for several reasons despite its being based on only one of the three dimensions of cognitive structure
(viz., differentiation) identified in the conceptual framework. Chief among these reasons was that it is a more easily administered and scored test than others which are available. Also the theoretical assumptions underlying the development of the Bieri test are more similar to those presented in Chapter III (wherein the nature of cognitive structures is discussed) than any other test of cognitive complexity excepting the Schroder Sentence Completion Test. The Schroder test was not used because its complex scoring procedures precluded its use in the experimental design chosen for the study. Finally, the Bieri test, however inadequate as a measure of cognitive complexity, was judged by Vannoy (1965) to be the best general measure of cognitive complexity of the twenty he analyzed because it seemed to tap to some degree all three of the major components of complexity identified by Vannoy.

The other instrument used in the study was Budner's (1962) Intolerance of Ambiguity Test. This instrument was selected because it purports to measure a trait, tolerance of ambiguity, which could be presumed to be similar to tolerance of uncertainty, whose relationship to receptivity-adaptability was of concern in this study. The instrument was left essentially unaltered with the exception that, to permit mechanical scoring, the number of possible subject responses to each statement on the test was reduced from six to five.
Results.

Hypothesis A: As the scope of the problem diminishes, the scope of receptivity adopted by an individual will decrease.

The most basic proposition discussed in the theoretical portion of this thesis and investigated in its empirical portion is the notion that individuals significantly alter their patterns of receptivity to information as the conditions of the problem situations they face change. To the extent that one factor contributing to information input complexity is a test of this basic notion the results of the study give it support. Specifically, the results support the hypothesis that a change in the problem's scope, one factor contributing to information input complexity, is associated with a change in an individual's scope of receptivity to information. Table 5.4 presents the analysis of variance table pertaining to Hypothesis A.

The first column in Table 5.4 gives the variables and their combinations included in this analysis of variance. Line two of the table gives the data pertaining to Variable P, the scope of the problem. As mentioned in the description of the experiment given earlier, two levels or problem scope were present in each problem: broad problem scope and narrow problem scope. The variance attributable to the main effect of this problem scope variable was significant at the .01 level of significance as shown in the sixth column of the table. The F-Test value for the main effect of the problem
TABLE 5.4

RESULTS OF ANALYSIS OF VARIANCE WITH INTOLERANCE OF AMBIGUITY AS THE BETWEEN-SUBJECTS VARIABLE

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
<th>Expected Mean Square</th>
<th>F Statistic</th>
<th>Relevant Hypotheses</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>160.9</td>
<td>1</td>
<td>160.9</td>
<td>256.0</td>
<td>0.457</td>
<td>-</td>
</tr>
<tr>
<td>P</td>
<td>14716.8</td>
<td>1</td>
<td>14716.8</td>
<td>256.0</td>
<td>160.8*</td>
<td>A</td>
</tr>
<tr>
<td>T</td>
<td>11580.5</td>
<td>1</td>
<td>11580.5</td>
<td>256.0</td>
<td>157.9*</td>
<td>B</td>
</tr>
<tr>
<td>A X P</td>
<td>0.0</td>
<td>1</td>
<td>0.0</td>
<td>128.0</td>
<td>0.0</td>
<td>C</td>
</tr>
<tr>
<td>A X T</td>
<td>5.5</td>
<td>1</td>
<td>5.5</td>
<td>128.0</td>
<td>0.1</td>
<td>C</td>
</tr>
<tr>
<td>P X T</td>
<td>2265.5</td>
<td>1</td>
<td>2265.5</td>
<td>128.0</td>
<td>120.5*</td>
<td>A and B</td>
</tr>
<tr>
<td>A X P X T</td>
<td>5.5</td>
<td>1</td>
<td>5.5</td>
<td>64.0</td>
<td>0.3</td>
<td>C</td>
</tr>
<tr>
<td>S(A)</td>
<td>21688.8</td>
<td>62</td>
<td>349.8</td>
<td>8.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SP(A)</td>
<td>5680.5</td>
<td>62</td>
<td>91.6</td>
<td>4.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ST(A)</td>
<td>4522.9</td>
<td>62</td>
<td>72.9</td>
<td>4.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SPT(A)</td>
<td>1168.9</td>
<td>62</td>
<td>1819</td>
<td>2.0</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Significant at the .01 level.

KEY:  A = Budner Intolerance of Ambiguity  
P = Problem Scope  
T = Time/Money Available

scope was 160.8 while the value required for significance with one and sixty-two degrees of freedom is 7.08.

Further evidence of the study's support for Hypothesis A is given when the mean subject score in the broad problem-scope conditions are compared with the mean subject score in the narrow problem-scope conditions. Table 5.5 gives the cell means for both the problem-scope variable and the time/money-available variable.
Table 5.5 shows the results of using Tukey's HSD method of multiple comparisons (Tukey, 1951). The Tukey test indicates whether or not the difference between means is significant and, in addition to indicating the significance of main effects, is an aid to interpreting the significant interaction effects between problem scope (Variable P) and time/money available (Variable T).

The first column in Table 5.6 indicates which cell means are being compared, for example, to determine whether the difference between the mean score under narrow problem-scope conditions and the mean score under broad problem-scope conditions is significant, the number five and number six cell
### TABLE 5.6
DIFFERENCES BETWEEN TREATMENT MEANS WITH SIGNIFICANCE DETERMINED BY TUKEY HSD METHOD OF MULTIPLE COMPARISONS

<table>
<thead>
<tr>
<th>Cell Comparisons</th>
<th>Effects</th>
<th>Differences Between Means</th>
<th>Relevant Hypotheses</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-6</td>
<td>Problem Scope Main Effect</td>
<td>10.72*</td>
<td>A</td>
</tr>
<tr>
<td>7-8</td>
<td>Time/Money Main Effect</td>
<td>9.52*</td>
<td>B</td>
</tr>
<tr>
<td>1-4</td>
<td>Problem Scope and Time/Money Interaction</td>
<td>20.23*</td>
<td>A &amp; B</td>
</tr>
<tr>
<td>2-3</td>
<td>Problem Scope and Time/Money Interaction (Opposed)</td>
<td>1.21</td>
<td>A &amp; B</td>
</tr>
<tr>
<td>1-3</td>
<td>Problem Scope with Ample Time/Money</td>
<td>6.5*</td>
<td>A</td>
</tr>
<tr>
<td>2-4</td>
<td>Problem Scope With Limited Time/Money</td>
<td>14.93*</td>
<td>A</td>
</tr>
<tr>
<td>1-2</td>
<td>Time/Money With Broad Problem Scope</td>
<td>5.30</td>
<td>B</td>
</tr>
<tr>
<td>3-4</td>
<td>Time/Money With Narrow Problem Scope</td>
<td>13.72*</td>
<td>B</td>
</tr>
<tr>
<td>1/2(7+8) - 1/2(5+6)</td>
<td>Problem Scope Compared to Time/Money</td>
<td>1.50</td>
<td>-</td>
</tr>
</tbody>
</table>

*Significant at .01 level
means from Table 5.5 are compared. In this case the difference is significant and we can conclude that the main effect of problem scope upon scope of receptivity was not a chance occurrence. This result thus supports Hypothesis A.

Hypothesis B: As the time and/or money available for problem completion diminishes, the scope of receptivity adopted by an individual will decrease.

As in the case of Hypothesis A, Hypothesis B was formulated to investigate the validity of the notion that changes in problem situations will cause individuals to alter their patterns of receptivity to information. While Hypothesis A concerned a variable that affected the information input complexity of a problem situation, Hypothesis B concerns variables which affect the arousal level of the individual in the problem situation. The specific variables mentioned in Hypothesis B are the time and the money available for problem solution.

As shown in the third line of Table 5.4 above, the initial analysis of variance did indicate that time/money available (Variable T) was a significant source of variance. The F statistic for Variable T (time/money available) was 157.9, while the F required for significance at .01 level was only 7.03.

As in the case of Hypothesis A, when the significance of the main effect of time/money available (Variable T) is tested by comparing the appropriate cell means (numbers 7 and 8 in Table 5.5) and subjecting them to the Tukey test, the results again support Hypothesis B. The difference between the
mean score of subjects under the limited time/money available conditions and their mean score under the ample time/money available conditions is 9.52, as shown in the third column of Table 5.6, while a difference of only 5.41 would be significant at the .01 level.

As mentioned earlier, the Tukey test for multiple comparison of means allows us to go beyond the data given in the initial analysis of variance which shows that the main effects of problem scope (Variable P) and time/money available (Variable T) and their interaction effect (see line 6 of Table 5.4) are significant. The nature of the interaction between these two variables becomes more clear when we refer again to the results of the Tukey multiple comparison analysis presented in Table 5.6.

As the third and fourth rows of the table show, the interaction between problem scope and time/money available is complementary in nature. That is, when the two variables are both operating to decrease an individual's scope of receptivity, their combined effect is much greater than either of them operating singly (row 3 of the table); and when the two variables are operating in opposition to one another their interaction has the effect of cancelling each other out (row 4 of the table).

This complementarity between problem scope and time/money available is also shown by the comparisons presented in rows 4, 5, 6, and seven of Table 5.6. The fourth and fifth
rows contain data suggesting that the effect of problem scope under conditions of limited time/money available is much stronger than under conditions of ample time/money available. Similarly, the sixth and seventh rows of the table show that time/money available has a significant effect upon scope of receptivity when the problem scope is narrow, but that the effect of time/money available does not reach significance when the problem scope is broad.

This last finding gives rise to an interesting implication regarding the interaction effects of the two variables (problem scope and time/money available). As argued in the theoretical chapters of this dissertation, it is usually quite functional for an individual to decrease his scope of receptivity when either the problem scope or the availability of time/money is decreased. At first glance the complementarity of these two variables when they interact would also seem to be quite functional. However, there are cases when this complementarity may be disfunctional. For example, when problem scope is broad it is probably more important for an individual to be responsive to decreases in time/money available for problem solution than it is when the problem scope is narrow. Yet this situation would call for the individual to respond to the two variables in an inverse fashion resulting in the seventh row of Table 5.6 showing a significant difference between means. This implication suggests that an individual with high receptivity-adaptability would have to do more than just follow
a natural tendency to decrease his scope of receptivity as more and more variables individually change in a direction calling for a decrease in receptivity. Rather, the individual would have to consider what sort of an interaction between the variables would result in the most appropriate pattern of receptivity for that particular problem situation.

A final comparison made in Table 5.6 does not pertain directly to either Hypothesis A or B, but is nevertheless of passing interest. The eighth row in the table shows the results of a comparison between the effects of problem scope and time/money availability. Since the difference in means is not significant, it suggests that neither of the two variables is significantly stronger than the other.

Hypothesis C: Intolerance of uncertainty as measured by the Budner Intolerance of Ambiguity Test is inversely related to intra-subject variation in scope of receptivity across problem conditions.

Hypothesis D: Cognitive complexity as measured by the Bieri Test of Cognitive Complexity is directly related to intra-subject variation in scope of receptivity across problem conditions.

The other two hypotheses investigated in this study concerned the relationship of intra-subject variance in scope of receptivity across problem-situation conditions to subject scores on the Budner Intolerance of Ambiguity Test (Hypothesis C) and the Bieri Test of Cognitive Complexity (Hypothesis D). The data pertaining to Hypothesis C is contained in rows 4,5,
and 7 of Table 5.4 above. The data pertaining to Hypothesis D essentially parallels that of Hypothesis C but is given in a separate table, Table 5.7 below.

TABLE 5.7
RESULTS OF ANALYSIS OF VARIANCE WITH COGNITIVE COMPLEXITY AS THE BETWEEN-SUBJECTS VARIABLE

<table>
<thead>
<tr>
<th>Sources of Variance</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
<th>Expected Mean Square</th>
<th>F Statistic</th>
<th>Relevant Hypotheses</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>20.7</td>
<td>1</td>
<td>20.7</td>
<td>256.0</td>
<td>0.057</td>
<td>-</td>
</tr>
<tr>
<td>P</td>
<td>14716.8</td>
<td>1</td>
<td>14716.8</td>
<td>256.9</td>
<td>168.8*</td>
<td>A</td>
</tr>
<tr>
<td>T</td>
<td>11580.5</td>
<td>1</td>
<td>11580.5</td>
<td>256.0</td>
<td>159.0*</td>
<td>B</td>
</tr>
<tr>
<td>C X P</td>
<td>265.9</td>
<td>1</td>
<td>265.9</td>
<td>128.0</td>
<td>3.05</td>
<td>D</td>
</tr>
<tr>
<td>C X T</td>
<td>21.5</td>
<td>1</td>
<td>21.5</td>
<td>128.0</td>
<td>0.296</td>
<td>D</td>
</tr>
<tr>
<td>P X T</td>
<td>2265.5</td>
<td>1</td>
<td>2265.5</td>
<td>128.0</td>
<td>120.0</td>
<td>A and B</td>
</tr>
<tr>
<td>C X P X T</td>
<td>1.0</td>
<td>1</td>
<td>1.0</td>
<td>64.0</td>
<td>0.529</td>
<td>D</td>
</tr>
<tr>
<td>S(C)</td>
<td>21828.9</td>
<td>62</td>
<td>352.8</td>
<td>8.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SP(C)</td>
<td>5414.6</td>
<td>62</td>
<td>87.3</td>
<td>4.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ST(C)</td>
<td>4506.8</td>
<td>62</td>
<td>72.7</td>
<td>4.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SPT(C)</td>
<td>1173.4</td>
<td>62</td>
<td>18.9</td>
<td>2.0</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Significant at the .01 level.

KEY:  
C = Bieri Cognitive Complexity  
P = Problem Scope  
T = Time/Money Available
It is quickly apparent by looking at the fourth, fifth, and seventh rows of these two tables that neither Hypothesis C nor Hypothesis D received any support from the study's results. An F statistic of 7.08 was required for significance and none of the interaction effects which included either intolerance of ambiguity (Variable A) or cognitive complexity (Variable C) demonstrated even a slight tendency toward reaching significance. It should be remembered that it was only the interaction of these two factors with the independent variables manipulated in the problem situations (i.e., problem scope and time/money availability) which relate to the hypotheses since it was predicted that intra-subject variation in scope of receptivity across conditions would be related to intolerance of ambiguity and cognitive complexity. It was postulated that these two characteristics would influence how much a subject responded to changes in factors potentially contributing to his arousal level or the information input complexity of the situation.

In the case of the Budner Intolerance of Ambiguity Test (Hypothesis C) there are several possible interpretations of the study's disappointing results. It may be that Budner's test is an adequate measure of intolerance of uncertainty and that the postulated relationship between this trait and receptivity-adaptability does not exist. It may be that the Budner test is not an adequate measure of intolerance of uncertainty on the other hand, which is a serious possibility
since its choice was based only upon the face validity of the Budner test and the logical (not empirical) relationship between ambiguity and uncertainty rather than upon any existing data.

Another, and more likely possibility, is that because the subjects were left to imagine the arousal level they would experience under the various conditions of the problem situations, the effect of arousal level (expected to be exacerbated by a high intolerance of uncertainty) upon subjects' patterns of receptivity was insufficiently powerful. This interpretation gains some support from the observation that subjects seemed to have been affected more by money as a factor contributing to arousal than by time availability. If this is because a lack of money and its effects are more easily imagined than a similar lack of time, an actual experiencing of factors contributing to arousal level by the subjects would quite likely have increased the possibility of a significant interaction effect supporting Hypothesis C showing up in the results. In other words, had the experimental design provided for a sufficiently strong means of inducing arousal, the postulated relationship between intolerance of uncertainty and receptivity-adaptability might have shown up as a significant interaction between intolerance of ambiguity and intra-subject variation in scope of receptivity.

\[2\]This result showed up in an unsystematic comparison of Variable T effects in the two different problem situations.
A final explanation of the failure of the results to give even minimal support to Hypothesis C concerns the discussion in Chapter IV of the shape of the curve describing the relationship between arousal and scope of receptivity (see pp. 156-166). There it was argued that the curve describing the relationship is probably an inverted, U-shaped curve. It was also argued that some of the characteristics of cognitive structure that favor high receptivity-adaptability and a higher tolerance of uncertainty would tend to mitigate the effects of arousal. This would steepen the sides of the curve, making it less and less bell-shaped, for a subject with a greater tolerance of uncertainty but leave the major areas under the two curves coinciding. It would be only in limited, critical portions of the curves near either tail that significant differences between subjects would appear. Figure 5.8 presents such curves for two hypothetical subjects. Note that the two subjects differ in their reactions to arousal only in those portions of the curves near the tails and labelled 'K' and 'L'. The significance of this occurrence is that the arousal level induced by the problem situations would have to fall into those limited critical regions of the arousal curve in order for the effects of differences in tolerance of uncertainty to manifest themselves as differences in scope of receptivity. It is quite possible that for most of the subjects, the act of imagining the arousal levels they would experience in the different problem-situation conditions would
FIGURE 5.8
TWO HYPOTHETICAL SUBJECTS' CHANGES IN SCOPE OF RECEPTIVITY AS A FUNCTION OF THEIR AROUSAL LEVEL

KEY: ______ = subject with high tolerance of uncertainty
------ = subject with low tolerance of uncertainty

not result in an arousal level high enough or low enough to put them in the critical areas near the tails of the curve where inter-subject differences would be greatest. Consequently, subject variability with regard to tolerance of uncertainty was probably too small to be detected of to be of import.

With an eye toward such future research efforts, we should now speculate as to why the relationship between the Bicri test scores and the intra-subject variability were not strong enough
to appear in the results. One possible explanation is essentially the same as the last one discussed above concerning the Budner test: the manipulation of the arousal-level variable (time/money available) was probably not strong enough to bring out significant differences in intra-subject variability attributable to inter-subject differences in cognitive complexity.

A second possible explanation is based on the assumption that cognitive complexity is probably a content-specific trait rather than a general trait. Assuming this is the case, and recalling that the Bieri test was constructed only to measure cognitive complexity in the area of social perception, we may conjecture that the lack of overlap in areas of content (sub-parts of a cognitive structure) covered by the Bieri test and the problem situations made stronger relationships unlikely. This would occur if there were no consistent, positive relationship between subjects' cognitive complexity in the areas covered by the Bieri test and their cognitive complexity in the areas covered by the problem situations.

A third possible explanation of the lack of significant interaction effects also concerns the construction of the Bieri test. As mentioned earlier (pp. 188-190), Bieri conceived of cognitive complexity in terms of the differentiation of a cognitive structure while the theoretical framework presented in Chapter IV characterizes cognitive complexity as consisting of the degree of differentiation and the degree of comprehen-
siveness and the degree of integration of the structure. Thus the Bieri test purports to measure only one of the three characteristics of cognitive structure we have hypothesized will influence receptivity-adaptability. Although no guesses were made in Chapter IV as to which of these characteristics is most closely related to receptivity-adaptability, it is not unlikely that they have differential importance. For example, differentiation of cognitive structures may correlate highly with the scope of receptivity individuals adopt under given problem-situation conditions, but not correlate highly with adaptability of scope of receptivity across conditions. If this were the case, and if integration of cognitive structures correlated highly with both scope of receptivity and adaptability, the influence of cognitive complexity would have been altogether lost in this study since the analyses considered only the relationship between differentiation (as measured by the Bieri test) and adaptability (as measured by the intra-subject variation in scope of receptivity.) To alleviate this problem, future research, as mentioned at the beginning of this chapter, would have to measure cognitive complexity as a multi-dimensional variable, rather than as a uni-dimensional variable as it was measured in this study.

In summarizing the study's results, we may say that the data supports the notions that persons adapt their patterns of receptivity to problem-situation characteristics, but the data gives no support whatsoever to the notion that tolerance of
uncertainty and receptivity-adaptability, or cognitive complexity and receptivity adaptability are closely related, although several plausible reasons for why these relationships could exist without appearing in the data can be offered.
CHAPTER VI
IMPLICATIONS FOR RESEARCH AND PRACTICE

It is customary and reasonable to conclude an empirically oriented dissertation with a chapter devoted to the identification of the implications the study has for further research in that field or for applications in a closely related practical field. My primary goal in this dissertation has been to present the broad outlines of a theory regarding the determinants of an individual's receptivity to information, based on a structuralist view of an individual's interaction with his environment. Only secondarily was my goal to take a first step toward an investigation of the major hypotheses of which the theory is composed. The scope of the theoretical, or conceptual framework outlined is broad. By contrast, the empirical undertaking, that first step toward the investigation of major hypotheses, is narrow. As a consequence, the implications of the theoretical portion of the dissertation are broad, speculative, and pertain to suggested directions that educational/psychological research and educational practice might take while the implications of the empirical study are narrower and pertain to specific suggested research projects that might be undertaken. This concluding chapter reflects this difference by dealing with implications in two separate sections: (1) implications of the empirical study...
for further research; and (2) implications of the conceptual framework for further research and for educational practice.

Implications of the Empirical Study for Further Research

Two of the hypotheses investigated in the study received strong support:

Hypothesis A: As the scope of the problem diminishes, the scope of receptivity adopted by an individual will decrease.

Hypothesis B: As the time and/or money available for problem completion diminish, the scope of receptivity adopted by an individual will decrease.

Among the implications of these hypotheses is that individuals do adapt their patterns of receptivity to information to changing problem situations. A series of experiments should be directed at discovering what the situational characteristics are that influence these changes in receptivity, and a parallel series of experiments might be directed at discovering what patterns of receptivity to information are most appropriate to effective problem solving given defined sets of situational characteristics. The results of a successful set of such experiments would be two-fold. The first result would be a greater knowledge of the problem-solving process - one including the information-gathering component. The study reported here assumed that two categories of situational characteristics, those contributing to arousal level and to information input complexity, are important influences upon
the range of categories regarded as pertinent during information gathering. One characteristic from each category, time/money availability (arousal level factor) and problem scope (information input complexity factor), was chosen to test this assumption initially, and the results were strong enough to suggest that further investigation of the effects of these characteristics and others in the same categories would be fruitful.

The second result of a series of experiments such as that suggested above would be the establishment of a base for constructing a means of measuring individual differences with respect to the effect of specific situational characteristics upon information-gathering aspects of problem solving. It is likely that situational characteristics contributing to arousal level and information input complexity probably have significant differential effects on people and that these differences would have import for other areas of investigation into problem-solving processes. A significant practical concern worth investigating would be the implications of the differential influences of these situational characteristics upon persons taking allegedly "standardized" aptitude and achievement tests; for example, what effect does time-availability have on different test-takers' scopes of receptivity.

The other two hypotheses investigated in this study concerned possible sources of these individual differences. Neither Hypothesis 3, that subject intolerance of ambiguity
as measured by the Budner test is related to intra-subject variation nor Hypothesis 4, that cognitive complexity as measured by the Bieri is related to intra-subject variation in scope of receptivity, received significant support. These results may suggest that the search for underlying differences in human traits influencing differences in receptivity-adaptability should be broadened to include others besides cognitive complexity and tolerance of uncertainty. However, the more important implications of these inconclusive results may be methodological rather than theoretical. On the one hand, actual problem-solving situations with experimentor control over factors that affect arousal levels may have to be substituted for paper and pencil situations requiring subjects to imagine the presence of these factors. On the other hand, perhaps the development of better instruments for measuring tolerance of uncertainty and cognitive complexity should precede any further attempts to link either of these factors with individual differences in receptivity-adaptability.

More generally speaking, the most significant implication of the results of the empirical study is that receptivity-adaptability is a concept worth further investigation.

Implications of the Conceptual Framework

Implications for Future Research. In addition to the research endeavors suggested in the previous section and on pages 178 to 183 above which focus upon the relationships between characteristics of cognitive structure and receptivity-
adaptability, the conceptual framework presented in Chapter IV suggests the importance of identifying and investigating possible sources of individual differences in characteristics of cognitive structure. Careful case studies of children identified as being various "cognitive types" similar to the studies conducted by Adorno et al. into the early home and school environments of children could yield important insights into environmental factors which are possible contributors to differences in cognitive development. Further, more precise study of these factors could then be undertaken. In particular, the thinking underlying the theory developed in Chapter V implies that the roles played by parents and early teachers in controlling the child's exposure to uncertainty and the consequences of such exposures may be crucial. For example, do highly authoritarian parents on the one hand reduce a child's exposure to uncertainty through tight control over the behavior patterns he or she is allowed to engage in and through limiting in a constant way the environmental stimuli to which the child is exposed? And might they on the other hand foster a low tolerance for uncertainty in the child by meting out punishment when he or she departs from the prescribed patterns of behavior (i.e., delves into uncertain areas). Similarly, could highly authoritarian parents encourage an over-dependence upon source-orientation and/or attitudinal-valence types of category accessibility rules? Such might be the case if these parental types consistently insisted that the child use the source and/or attitude valence
of information as the criteria for accepting or rejecting information from the environment.

Implications of the Conceptual Framework:

A. Implications for future research. In Chapters II through IV two major conceptual themes were developed: (1) that receptivity to information is most appropriately described as a dynamic process undergoing transformations as the characteristics of the situations in which an individual finds himself change, and (2) that the characteristics of an individual's receptivity to information are linked to characteristics of his cognitive structure through the influences of the latter on the individual's emotional or affective states when confronted with uncertainty. The implications of the thinking upon which these two themes are based fall into three broad research areas. The first of these is an investigation of the process involved in an individual's selectively receiving information from his external environment and/or stored in or generated by his mind. A preliminary attempt was made in the discussion of Chapter III (pp. 77ff) to identify key components of patterns of receptivity to information - namely category accessibility rules of several types and scope of receptivity. This attempt to identify the critical components of receptivity patterns serves only to highlight the value a systematic investigation of this issue would have for facilitating further exploration into individual differences in receptivity to information. The departure made
in the conceptual framework from characterizing receptivity only in terms in scope and degree of openness to counter-attitudinal information by introducing the notion of category accessibility rules adds a new, and perhaps useful, perspective to explorations into individual differences in receptivity.

The conceptual framework also implies that future investigations into receptivity should lay a heavier stress upon exploring the interaction of situational variables such as time availability and information novelty with personality/cognitive characteristics of individuals. More specifically, the conceptual framework recommends particular attention to situational factors contributing to arousal and/or information input complexity and their interaction with characteristics of cognitive structure such as comprehensiveness, differentiation, and integration with personality characteristics related to tolerance of uncertainty (e.g., tolerance of ambiguity, manifest anxiety, degree of felt security, etc.).

One of the more intriguing notions discussed in the conceptual framework (pp. 105ff) was that of the difference between positive, negative, and ambivalent arousal as factors influencing patterns of receptivity to information. Because this is an extension beyond the usual treatment of arousal as a single factor, it also merits consideration as a topic for future research into receptivity patterns and their determinants.
A second research area for which the conceptual framework has implications is the area of problem solving. The most obvious implication is that the information seeking/processing aspect of problem solving needs to be studied as a constantly changing process with an attempt made to identify the different patterns of receptivity appropriate to particular problem-solving phases (e.g., problem definition, identification of alternative solutions, evaluating potential consequences of a given situation, etc.) and to different problem characteristics (e.g., problem scope, problem complexity, solution verifiability, etc.).

In addition, the conceptual framework supplies a rationale for following the lead of Schroder, Driver, and Streufert (see pp. 156 ff) in investigating the differential effects of situational factors upon individuals during the information gathering phases of problem solving. Their categorization into factors contributing to potential information input complexity and factors contributing to potential arousal level provide two possible foci for such investigations.

A third research area for which the conceptual framework suggests possible lines of exploration is the area of cognitive development. A sizeable portion of Chapter III is devoted to identifying and discussing characteristics of cognitive structure and three of them (comprehensiveness, differentiation, and integration) selected as the most important in determining the cognitive complexity of a particular
individual. This assumption needs a much more complete exploration than it has yet received - an exploration that first attempts to define the role each plays in determining cognitive complexity and then attempts to determine the nature of their interrelationships.

The extensive discussion given each of these characteristics in Chapter III (see pp. 60 ff) implies that a fruitful approach to their exploration might be based upon the notion of a cognitive structure made up of categories which in turn consist of the overlapping of the dimensions which define them. This notion of evaluative dimensions as the basic building block of cognitive structure is attractive because it is consistent with the essential multi-dimensional nature of environmental phenomena and allows for the explanation of differences in perception of a given phenomenon among different individuals.

In Chapter IV, the discussion of cognitive structure was expanded to a consideration of the process by which changes in a cognitive structure would take place. The relationship between uncertainty, arising out of an individual's encountering a situation the outcome of which he could not predict because of incongruities between the situation and his cognitive structure, and arousal was cited as a crucial factor in determining whether or not an individual would attempt cognitive restructuring. This is a basic hypothesis, which if true, could have significant implications for educational
practices (see section below) and for this reason merits further investigation. On a broader scale, reasoning presented in the conceptual framework implies that future investigations into the sources of individual differences in cognitive complexity should give careful attention to the interrelationship between aspects of the environment pertaining to an individual's cognitive functioning (e.g., variety of phenomena present, level of abstraction at which information pertaining to phenomena are presented, the distinctness of dimensions characterizing the phenomena, the sequence of presentation of stimuli, etc.) and aspects pertaining to his affective state (e.g., threat presented by failure to overcome uncertainty, security level associated with the environment, the potential for receiving positive outcomes as a result of encountering uncertainty, etc.).

Implications for educational practice. Given the absence of significant experimental validation of most of the conceptual framework presented in Chapter IV, all practical implications derived from it must be tentative. It should also be noted that none of the implications for educational practice discussed below are very novel since most of them conform to practices currently based on a smattering of learning theory and a sizeable store of intuition and "conventional wisdom." The implications are nevertheless presented because they help to reinforce presumably desirable practices - to raise their priority - lest they be neglected
for other practices also supported by intuition and "conventional wisdom" but not by any systematic theory, however untested.

The most general implication contained in the conceptual framework concerns the role uncertainty plays in motivating attempts to make changes in cognitive structure resulting in cognitive growth. Following Berlyne's notion of conceptual conflict one can reason that uncertainty arises when an individual encounters an incongruity between environmental phenomena and his representation of the environment as embodied in his cognitive structure. Because the individual cannot rely on the relationships represented in his cognitive structure to predict the consequences likely to follow from the occurrence of incongruent phenomena, he has no means of choosing actions on his part that will lead to optimum outcomes for him. Consequently, the individual experiences arousal, which, if negative he will wish to relieve and if positive or ambivalent will be eager to forgo in favor of discovering and experiencing anticipated rewarding outcomes. A significant means of alleviating negative arousal through restoring predictability and removing uncertainty is for the individual to engage in information-gathering behavior (involving either externally available information or information generated internally by directed thinking) and to use this information to make appropriate changes in one's cognitive structure - changes that render it congruent with the
environment and restore the ability to predict the consequences of events.

Applying this principle of motivation to educational settings implies that a major role to be played by the educator is that of arranging for his students to encounter significant incongruities between their cognitive structures and their environment, the latter being partially susceptible to manipulation by the educator. It is apparent than, that simply providing information to a learner, even when it is accompanied by some extrinsic form of motivation to recall the information or use it in the process of solving a problem, may not be sufficient to motivate the learner to undertake cognitive restructuring. For the latter to occur, a significant incongruity must be encountered.

Related to this implication for educational practice is one derived from the notion that an individual can choose to deal with uncertainty either by attempting to overcome it through cognitive restructuring or through isolating himself from the environmental or internal stimuli that are the source of the incongruity. The assumption made in the conceptual framework is that the former course of action will only be chosen if the incongruity is of an optimal size (or the stimulus situation moderately novel according to Piaget). Recall that optimal incongruity occurs when the incongruity is neither so small that the relevant cognitive categories are not differentiated enough to allow the individual to perceive the
incongruity nor so large that the comprehensiveness and/or integration of the individual's cognitive structure is insufficient to allow him to perceive appropriate structural changes.

The application of this principal of optimal incongruity to educational practice calls for the educator to be both sufficiently familiar with each of his students' cognitive structures and sufficiently concerned with getting continuous feedback from his students to allow him to make reasonably accurate judgements about what learning situations would expose each student to optimal levels of incongruity. The teacher's responsibility, then, is to insure that the cognitive restructuring necessary to remove the incongruity does not require excessive increases in comprehensiveness (the formation of new cognitive categories), in differentiation (the addition of new dimensions to existing categories), or in integration (the recognition of dimensions held in common by new or existing categories). Phrased in more general terms, the principle of optimal incongruity implies that the major concern of the educator must be to help the student make transitions from one level of cognitive development to another and should not be to confront the student with situations which cater strictly to his present level of cognitive development or which presume a level of cognitive development which the student is incapable of achieving because the cognitive restructuring involved is too extensive.
In the conceptual framework the emphasis placed on the existence of three interrelated characteristics of cognitive structure (comprehensiveness, differentiation, and integration) suggests yet another educational practice pertaining to cognitive development. This is quite simply that both curriculum development and instructional activities must have as their object the development of all three characteristics of the cognitive structure. Educators concerned only with increasing comprehensiveness are wont to neglect two other important cognitive capacities. They may neglect the importance of increasing students' capacities to make subtle discriminations (i.e., they fail to increase the differentiation of their students' cognitive structures) or they may neglect the importance of increasing their students' capacities to perceive relationships between diverse phenomena (i.e., they fail to increase integration of their students' cognitive structures).

Another implication that the conceptual framework has for educational practices pertains specifically to increasing problem-solving effectiveness. This implication is that much greater effort should be given to helping students develop the information selection/rejection processes involved in problem solving. Just as students can be taught to apply important components of the scientific method of investigation, so could students be taught to apply principles relating to the appropriateness of particular patterns of
receptivity to different problem-solving situations. The effectiveness of problem-solving efforts would be greatly improved if individuals consciously select appropriate patterns of receptivity, that is appropriate scopes of receptivity and category accessibility rules, for the situations with which they are dealing. Currently most public school curricula concerned with learning in the cognitive domain focus upon the acquisition of knowledge contained within discrete disciplines rather than focusing on the acquisition of general intellectual skills such as the one just discussed. The generalizability of public school learning to "real life" situations could be noticeably enhanced by curricula designed specifically to foster the growth of this and other general intellectual skills.

In addition to educational implications which concern learning in the cognitive domain, the conceptual framework suggests some guidelines for educational practices pertaining to the affective domain. The first of these relates directly to the preceding discussion regarding the development of skill in matching one's receptivity pattern to the characteristics of the problem-solving situation (developing a high degree of receptivity-adaptability). If this skill is to be developed, students must not only be able to make correct judgements about the scope of receptivity and category accessibility which should be adopted, they would also have an appreciation of the psychological dynamics underlying the
adoption of particular patterns of receptivity by themselves and others. Commitment to maintaining a perspective that acknowledges the influences of situational factors which contribute to information input complexity and arousal level upon an individual's behavior would be necessary before he could accurately assess the character of, and exert control over, his patterns of receptivity.

Also pertinent to an educator's concern with the affective development of students is the hypothesized role an individual's tolerance of uncertainty plays in determining his receptivity-adaptability. The implication of this hypothesis is that teachers should be highly concerned with developing in their students an appropriate attitude towards uncertainty. On the one hand teachers should expose students to situations in which encountering uncertainty leads to positive arousal, i.e., situations of uncertainty wherein the students' anticipated $CL_{alt}$'s are higher than their current comparison levels (CL) (see pp. 105 ff.). On the other hand it requires that teachers provide situations in which the students experience negative arousal (their anticipated $CL_{alt}$'s are lower than their CL's) but are successful in avoiding the anticipated adverse consequences of the encounter with uncertainty by carrying out the cognitive restructuring necessary to restore congruence between environment and cognitive structure. Repeated exposures to both of these types of situations would help the students
to build and/or maintain a higher tolerance of uncertainty than if, as is often the case, the predominant outcome of their encounters with uncertainty are negative arousal followed by the experiencing of anticipated adverse consequences.

Finally, the importance of tolerance of uncertainty in determining an individual's R-A profile also necessitates that the teacher not exacerbate the consequences of a student's unsuccessful attempts to overcome uncertainty by cognitive restructuring. This would mean providing encouragement and support to the student when he is unsuccessful - encouragement that helps the student continue to tolerate uncertainty and continue to attempt to make appropriate changes in cognitive structure, and support that will help him identify the needed changes.

The hypotheses contained in the conceptual framework also imply that school environments should possess particular characteristics. Despite the important part a teacher must play in providing students with optimal levels of incongruity between their cognitive structures and their environments, the realities of present school staffing patterns preclude a teacher's having adequate time to provide and systematically monitor a sufficient number and variety of learning situations to cater to the cognitive development needs of all students. If, as Piaget argues (see pp. 92 ff), a child will select from its environment those stimuli that are moderately novel (i.e., optimally incongruent),
it would be reasonable to rely on an adequately planned but relatively unmonitored total school environment to contain a broad range of stimuli capable of providing each child enough encounters with optimal incongruity to supplement the more carefully planned and monitored learning situations arranged by teachers. But for this to be the case, the school environment must be diverse and constantly changing rather than uniform and bound by strictures which prevent a broad range of interactions between students and the events and objects in their environments. It must also facilitate frequent and varied interactions between the teacher and individual students rather than constrain the teacher to "subject-centered" and total-class interactions with students. Only in the former kind of environment does the teacher have ample opportunity to assess the character of each student's cognitive structure and motivate the student's cognitive development through his contributing to a process in which the student encounters optimal incongruity, seeks or generates new information about the incongruent aspects of the environment, and then changes his cognitive structure to bring it back into congruence with the environment.

To foster in students a degree of tolerance for uncertainty sufficient to encourage continuing cognitive development, the school environment should have less predictability and appear less structured from the student's point of view than is typically the case in public schools now. Highly structured
schedules, spaces divided into isolated subparts, and rigid rules governing behavior patterns are likely to militate against students' encountering uncertainty. What limited uncertainty students do encounter in such an environment is often the result of their subordination to the wishes of a series of arbitrary authority figures and is likely to be associated with negative arousal and therefore lower the students' tolerance for uncertainty. Instead, schools should strive for an atmosphere often punctuated with uncertainty and likely to induce positive arousal (excitement associated with anticipated favorable consequences resulting from successful attempts to overcome uncertainty). Normatively based evaluation procedures which promote comparisons between students and the labelling of some of their efforts to overcome uncertainty as "failures" or inadequate performances, are likely to cause students to associate negative arousal with the encountering of uncertainty. Evaluation procedures stressing diagnosis of individual progress rather than general categorization of student behaviors should be used if tolerance for uncertainty is to be built.

From the teachers' perspective the school environment should appear more structured, albeit in a flexible way, than it does to the student. This must necessarily be the case if the teacher is to be in a position to monitor individual students' needs and systematically manipulate factors in the students' environments to foster cognitive development. The
structure should consist of clear objectives at an institutional level toward which all teachers are working and of a well-conceived set of curricula which provides a flexible framework within which teachers can function. Thus, the characteristics of a school environment derived from a concern with the major hypotheses developed in the conceptual framework differentiate it from those found in "free schools" by emphasizing the importance of a flexible structure, clear goal orientation, careful monitoring of student progress toward goals, and consistent and systematic manipulation of the environment to provide students with carefully chosen learning situations. And, other equally important characteristics derived from the conceptual framework differentiate such an environment from those found in "traditional schools" by emphasizing ever-present variety, both planned and unplanned change, individually oriented teacher-student interactions, intellectual skills-oriented rather than "subject-oriented" curricula, careful encouragement of efforts to cope with uncertainty rather than adverse reactions to unsuccessful attempts, de-emphasis of constraining spatial arrangements, de-emphasis of constraining authority-subordinate relationships, and de-emphasis of rules governing behavior.

The presumptuous nature of this last set of educational implications underscores the motivation behind the theoretical and empirical tasks undertaken in this dissertation. Nearly all educational practice is based on equally tentative theoretical
notions or, more often, upon conventional wisdom that is seven parts intuition, three parts experience, and a dash of theory. Though grandiose, and consequently initially superficial, such efforts are needed to guide subsequent research efforts which systematically address the task of building a comprehensive theory of human psychological development. The results could have a profound impact on education and possibly upon the human condition.
APPENDIX

Instruments Used in the Empirical Study
On the following pages are eight problem situations which are intended to investigate human problem-solving behavior. Your task in each problem situation is to indicate the importance of different categories or elements of information to your solving the problem. For example, in solving the problem of where to buy your clothes the following categories of information might be available to you:

1. The relative expense of the clothes carried by the store.
2. The styles and types of clothing carried by the store.
3. The political party affiliation of the store's owner.
4. The availability of credit at the store.
5. How long the store has been doing business at its present address.

Your task would then be to indicate for each of the above categories of information if you think it is:

(a) CRITICAL INFORMATION (i.e. you could not solve the problem adequately without it)
(b) IMPORTANT INFORMATION (i.e. you could solve the problem without this information, but the solution would be much easier and/or better if you have this information)
(c) RELEVANT INFORMATION (i.e. you could definitely solve the problem a little more easily and/or better with this information)
(d) POSSIBLY RELEVANT INFORMATION (i.e. you could possibly solve the problem a little more easily and/or a little better with this information)
(e) IRRELEVANT INFORMATION (i.e. this information would be of no use to you in solving the problem)

Your indication of the importance of the item of information should be made by filling in the appropriate space opposite the category's number on the separate answer sheet. Your answers to the example given above might appear on the answer sheet as follows:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When proceeding through the set of sixteen problem situations, keep the following points in mind:
1. Read each problem carefully. Some of the problem situations appear to be exactly like one another but in actuality differ slightly (pay particular attention to underlined words and phrases).

2. Treat each numbered problem separately and without regard to any of the other problems you have done no matter how similar. For example when doing problem IV treat it as though you had not done problem II.

3. Do the problems in the order in which they are presented. Do not under any circumstances skip ahead to read or work on other problems or go back to reconsider any problems you have already done.

4. For the purposes of this experiment assume all the information given in the problems is correct even though you may think or know it is not accurate or true in reality.

Now please begin doing the problems.
I.

You are an aide to a very prominent United States Senator who has been receiving heavy pressure from women's groups to write and sponsor a bill legalizing abortions in the United States. The senator has assigned you the task of compiling and summarizing all background material relevant to the arguments made by both those against and those favoring the legalization of abortion nation-wide. The senator has asked that, whatever your feelings on the matter, you write an unbiased summary that he can use to decide whether or not to write and sponsor a bill to legalize abortion, and, if so, to decide what specific measures the bill should contain. This session of congress has just begun, so your summary is not needed for several weeks giving you plenty of time to carry out the assignment. In addressing yourself to the task the following elements of information are potentially available to you.

(Use information set A)
You are an aide to a very prominent United States Senator who has been receiving heavy pressure from women's groups to write and sponsor a bill legalizing abortions in the United States. The senator has assigned you the task of compiling and summarizing all background material relevant to the arguments made by both those against and those favoring the legalization of abortion nation-wide. The senator has asked that, whatever your feelings on the matter, you write an unbiased summary that he can use to decide whether or not to write and sponsor a bill to legalize abortion, and if so, to decide what specific measures the bill should contain. This session of congress has just two weeks remaining, so the senator needs your report on his desk within the next two days leaving you very little time in which to complete the task. In carrying out the assignment the following elements of information are potentially available to you.

(Use information set A)
You are a law clerk for a Supreme Court Justice of the United States and you have been assigned the task of compiling and summarizing all background material relevant to a Court Opinion the Justice must write. The opinion must justify the as-yet-unannounced decision of the Court to strike down a Montana state law prohibiting abortions. Whether you agree or not with the Court's decision, your task is to supply the Justice with material which can be included in the legal rationale for the Court's ruling the Montana abortion law unconstitutional. Because the Court is presently hearing another case and will not be announcing its ruling for several months, you have ample time to complete the task. In addressing yourself to the task the following categories of information are potentially available to you:

(Use information set A)
You are a law clerk for a Supreme Court Justice of the United States and you have been assigned the task of compiling and summarizing all background material relevant to a Court Opinion the Justice must write. The opinion must justify the as-yet-unannounced decision of the Court to strike down a Montana state law prohibiting abortions. Whether you agree or not with the Court's decision, your task is to supply the Justice with material which can be included in the legal rationale for the Court's ruling the Montana abortion law unconstitutional. Because the Court wishes to announce the decision shortly, you have only two days in which to complete the task, and get the summary on the Justice's desk. In carrying out the task the following categories of information are potentially available to you:

(Use information set A)
The new mayor of Vancouver, British Columbia has just hired you to direct a comprehensive study of possible solutions to Vancouver's rapidly growing transportation problems. He has chosen you, a generalist without specialized knowledge of transportation systems, to direct the study because he wants a final report from the study that reviews in an unbiased manner many possible approaches to solving the problem of overcrowded city streets. You have been given three years and a large budget for conducting the study and you are expected to produce a final report that can be used as the basis for both selecting a longterm solution to Vancouver's transportation problems and guiding the implementation of the chosen solution.

All you know about Vancouver at the outset of the transportation study is that it is a typical big city suffering from almost total dependence on the automobile as a form of transportation serving the city and the surrounding suburban and rural region. You must now identify what categories of information about different transportation systems you think the study should compile in order to produce the kind of final report desired by the mayor. The following categories of information are potentially available to you:

(Use information set C)
The new mayor of Vancouver, British Columbia has just hired you to direct a comprehensive study of possible solutions to Vancouver's rapidly growing transportation problems. He has chosen you, a generalist without specialized knowledge of transportation systems, to direct the study because he wants a final report from the study that reviews in an unbiased manner many possible approaches to solving the problem of overcrowded city streets. You have been given only six weeks and a very small budget for conducting the study and you are expected to produce a final report that can be used as the basis for both selecting a longterm solution to Vancouver's transportation problems and guiding the implementation of the chosen solution.

All you know about Vancouver at the outset of the transportation study is that it is a typical big city suffering from almost total dependence on the automobile as a form of transportation serving the city and the surrounding suburban and rural region. You must now identify what categories of information about different transportation systems you think the study should compile in order to produce the kind of final report desired by the mayor. The following categories of information are potentially available to you:

(Use information set C)
The new mayor of Vancouver, British Columbia is intent upon solving the problem of overcrowding and congestion on Vancouver's freeways and city streets. The Canadian Federal Government has offered to pay the bill for a full-scale study of Vancouver's transportation problems and to provide money to cover 50% of the cost of implementing a longterm solution if one condition is met. That one condition is that the new mayor prove by means of a small-scale pilot project that the automobile commuters and taxi users living in and around Vancouver will abandon their cars for some alternative means of transportation. The mayor has hired you to direct a study of possible transportation systems to identify a system that would be the most likely to attract drivers away from their cars. The study's final report will be used by the mayor for choosing a transportation system to be used in the pilot project and also for guiding the implementation of the pilot project.

All you know about Vancouver at the outset of the transportation study is that it is a typical big city suffering from almost total dependence on the automobile as the form of transportation serving the city and the surrounding suburban and rural area. You must now identify what categories of information about different transportation systems you think the study should compile in order to produce the kind of final report desired by the mayor. He has given you two years and a generous budget to accomplish the task. The following categories of information are potentially available to you:

(Use information set C)
The new mayor of Vancouver, British Columbia is intent upon solving the problem of overcrowding and congestion on Vancouver's freeways and city streets. The Canadian Federal Government has offered to pay the bill for a full-scale study of Vancouver's transportation problems and to provide money to cover 50% of the cost of implementing a longterm solution if one condition is met. That one condition is that the new mayor prove by means of a small-scale pilot project that the automobile commuters and taxi users living in and around Vancouver will abandon their cars for some alternative means of transportation. The mayor has hired you to direct a study of possible transportation systems to identify a system that would be the most likely to attract drivers away from their cars. The study's final report will be used by the mayor for choosing a transportation system to be used in the pilot project and also for guiding the implementation of the pilot project.

All you know about Vancouver at the outset of the transportation study is that it is a typical big city suffering from almost total dependence on the automobile as the form of transportation serving the city and the surrounding suburban and rural area. You must now identify what categories of information about different transportation systems you think the study should compile in order to produce the kind of final report desired by the mayor. He has given you only six weeks and a very small budget to accomplish the task. The following categories of information are potentially available to you:

(Use information set C)
1. Statistics compiled by the University of Indiana comparing the number of upper- and middle-class women who had secured legal abortions in the United States and abroad to the number of lower-class and poverty-level women who were able to secure legal abortions in the United States and abroad.

2. A ruling by the South Dakota State Supreme Court that the state's law prohibiting abortion violated the state constitution's guarantees of individual freedom and instructing the State Legislature that any law restricting a woman's action with respect to her own physical person (excepting actions which contribute directly to the immorality of others or to the physical detriment of her person) is prohibited by the state's constitution.

3. A treatise written by the president of Zero Population Growth arguing that abortion and other means of birth control must be allowed if the earth is to be saved from world-wide famine caused by over-population.


5. A recent issue of the Harvard Law Review reviewing decisions made by state and federal courts regarding state abortion laws.

6. A column by a nationally syndicated journalist arguing that abortion as an issue should be dealt with at the state rather than at the national level to prevent its becoming a national political issue that could cause an unhealthy schism along religious lines in the upcoming national elections.

7. The testimony of the president of the National Association of Adoption Agencies and Child Placement Services that there is an immense demand among childless couples for adoptable children and that liberalized abortion laws are the major contributor to this condition because they have drastically reduced the number of illegitimate children put up for adoption.

8. A psychotherapist's testimony before a state legislature committee that serious neuroses can be caused by the guilt often experienced by women who have had abortions.

9. A prominent Protestant theologian's contention that there is no moral justification for a society's taking from a woman the right to make decisions regarding abortion according to the dictates of her own conscience.

10. A national poll on the question: "Do you favor the liberalization or repeal of abortion laws in this country?"

11. Census Bureau statistics that show that the birth rate in the United States has decreased nearly to the point of zero population growth in the last five years.

12. Statistics compiled by the American Medical Association that four of every five illegal abortions not performed by a doctor result in death or permanent injury to the woman upon whom the abortion was performed.

13. A respected English philosopher's arguments concerning why abortion is immoral and an affront to the dignity of human existence.

14. An American Civil Liberties Union tract detailing legal arguments for why several of the Constitution's amendments protect the civil rights of women to obtain
15. A research article by a noted social scientist which describes the results of over-population in communities of rats as leading to a complete breakdown of social order in the rat communities, abnormally high intra-species aggression, and severe distortions of normal patterns of rat sexual behavior. The article concludes that excessive human population densities would probably lead to similar social disruptions.

16. A statement by the President of the United States that he did not believe any branch of the Federal Government should take a position on the issue of abortion, but that it should be left to the individual states to decide upon.

17. A Yale Law Review article authored by a noted "strict constructionist" which argues that the Supreme Court must exercise caution and restraint in interpreting the civil rights and individual freedoms sections of the Constitution or the Court will destroy the distinction between the legislative functions of Congress and the judicial responsibilities of the Federal Courts.

18. A set of volumes containing arguments and opinions made by the Supreme Court since its founding in 1789.

19. An impassioned letter written from a physician serving a prison term for performing an illegal abortion who is urging the passage of a liberalized abortion law in California that would remove that state's physicians from the untenable position of either having to break the law or having to refuse to perform operations which they believe are critical to the physical and psychological well-being of their patients.

20. A report by a presidential commission recommending the distribution of information about birth control and the availability of legal abortions as part of a comprehensive government effort to plan and control population growth in the United States.
1. To what extent the system will disrupt present pedestrian, automobile, and bus routes.

2. How the system will affect the street-level aesthetics of the downtown area of the city.

3. What effect the system will have on the incidence of crime in various locations within the city including along its major transportation routes.

4. How aesthetically attractive the system's vehicles will be.

5. How many jobs are likely to be created by the construction of the system.

6. How the system will affect the housing patterns of different socio-economic groups.

7. How the system is likely to influence the growth or decay of retail businesses along its routes.

8. What influences the system can be expected to have on future patterns of population density in and around the city.

9. How likely the noise level of the system will prove disturbing to private residents, schools, hospitals, etc.

10. How quiet and comfortable the system will be for passengers during rush hour periods.

11. How the system is likely to influence the degree to which new building construction in the city will replace older buildings.

12. How long it will take to actually put the system into operation.

13. To what extent construction and operation of the system will require re-location of inhabitants of the city and surrounding areas.

14. How the operation of the system will affect the presently available sources of energy upon which the city is dependent.

15. What activities the system will allow passengers to engage in while they are being transported (e.g. reading, eating, watching television, playing cards, betting on horses, etc.)

16. To what extent the system lends itself to use as a means of raising public revenue through the sale of advertising space.

17. How the system will affect the city's prominent features of physical beauty.

18. How convenient it will be for the users of the system to transport packages, luggage, and other objects.

19. How the system is likely to influence community participation in neighborhood vs. city-wide cultural and entertainment events.

20. How the system will affect the habitats of local wildlife.
The persons described below represent specific individuals that you know personally. In each of the numbered spaces at the top of the grid on the following page, write the first name or initial of the person who is correspondingly numbered below on this page. For example, in space 1 at the top of the grid write your name or initials, etc. Do not repeat any names. If a person is already listed, select a second choice.

(1) Yourself.
(2) A person you dislike (or have disliked)
(3) Your mother (or person most like a mother)
(4) A person you know whom you would like to help.
(5) Your father (or person most like a father)
(6) Closest friend of the same sex.
(7) Closest friend of the opposite sex (or spouse)
(8) A person with whom you feel most comfortable.
(9) A boss you had on a previous job.
(10) A person you know who is difficult to understand.

You will notice on the page containing the grid that there are ten pairs of traits along the right side of the grid. Starting with the first pair (shy-outgoing) you are to decide for each person you have listed which half of the pair, "shy" or "outgoing", best describes him. If a person is better described by the trait "shy" write in the box under his name an "L". However, if a person is better described by the trait "outgoing", write in the box under his name an "R". "L" means that you think the person is better described by the trait on the left, and "R" means that he is best described by the trait on the right. After you have rated all ten individuals on the first pair of traits, repeat the process for the next pair (adjusted-maladjusted) and so on until you have rated every person on all the pairs of traits. Be sure to rate all persons listed on each pair of traits before proceeding to the next pair of traits. When you are finished, there should be a rating in each box. Do not leave any boxes blank.
We would like to have your opinion on a variety of topics. The following are statements with which some people agree and others disagree. Please mark each one on the answer sheet (numbers 1 through 16), according to the amount of your agreement or disagreement, by following the scale below:


1. A good teacher is one who makes you wonder about your way of looking at things.
2. Teachers or supervisors who hand out vague assignments give a chance for one to show initiative and originality.
3. People who insist upon a yes or no answer just don't know how complicated things really are.
4. An expert who doesn't come up with a definite answer probably doesn't know too much.
5. Many of our most important decisions are based upon insufficient information.
6. I like parties where I know most of the people more than ones where all or most of the people are complete strangers.
7. It is more fun to tackle a complicated problem than to solve a simple one.
8. A person who leads an even, regular life in which few surprises or unexpected happenings arise, really has a lot to be grateful for.
9. In the long run it is possible to get more done by tackling small, simple problems rather than large and complicated ones.
10. People who fit their lives to a schedule probably miss most of the joy of living.
11. I would like to live in a foreign country for awhile.
12. The sooner we all acquire similar values and ideals the better.
13. There is really no such thing as a problem that can't be solved.
14. A good job is one where what is to be done and how it is to be done are always clear.
15. Often the most interesting and stimulating people are those who don't mind being different and original.
16. What we are used to is always preferable to what is unfamiliar.
SOURCES CONSULTED


