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## The Ability to Perceive Embedded Figures: Its Relation to Personality, Age, Sex, and Intelligence

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THE ABILITY TO PERCEIVE EMBEDDED FIGURES:  
ITS RELATION TO PERSONALITY, AGE, SEX  
AND INTELLIGENCE

by

Sister John Amadeus Fronke, C.S.J.

A Thesis Submitted to the Faculty of the Graduate School  
of Loyola University in Partial Fulfillment of  
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## CHAPTER I

### Introduction

A central problem in psychology, the study of perception has been called a psychologist's psychology. It is one of the major research topics in psychology today. Up to this time, the studies of perception have been influenced by one or the other of two main theoretical approaches. The one approach is based on the supposition that perception is determined to a great extent by the nature of the outer world. The other approach emphasizes the nature of the stimuli which give rise to perceptual experience and the combined operations of the sense organs and neural structures which receive and pass the stimuli on.

Although much research has been done using either one or the other approach as a theoretical basis, few psychologists are well-satisfied with results of many years of labor. Existing theories to account for the character of our perceptions, of and by themselves, are not satisfactory.<sup>1</sup>

Koffka, looking back on a history of many decades of research

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<sup>1</sup>James J. Gibson, The Perception of the Visual World (Boston, 1950), p. 3.

pursued before him, issued a challenge to his contemporaries in his Principles of Gestalt Psychology in 1935: "Why do things look as they do?" This challenge is echoed in 1950 by Gibson in his Perception of the Visual World: "How do we see the world around us?" The challenge remains to a great extent an unanswered and much disputed question.

More recently, by noting the wide individual variations met with in investigations of perception, investigators have been led to consider the possibility that the nature of perception might be more effectively studied by studying the psychological characteristics of the perceiver. A trend toward a gradual merging of efforts in the field of the study of perception and that of personality was demonstrated in the agenda of the meeting of the APA in Denver in 1949.<sup>2</sup> A symposium was devoted to the theoretical aspects of personal and social factors in perception. The general tone of the meeting might well be expressed in the title of G. S. Klein's and A. Schlesinger's paper as they query, "Where is the Perceiver in Perceptual Theory?"

The present paper following this trend, reports an investigation of a perceptual task, ability to perceive a simple figure in a complex figure, showing its relation to age, sex, intelligence and the personality variable of ascendance-submission.

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<sup>2</sup> Symposium on Personal and Social Factors in Perception, Journal of Personality, XIX (1949), 1-59.

The embedded figures test, as the perceptual task, is used in this study after Witkin,<sup>3</sup> who studied this task extensively and standardized it in preparation for including it in his battery of perceptual tasks. He found the embedded figures task to be positively related to his other perceptual tasks which in turn show that differences in mode of perceiving revealed by these tests are related to profound personality differences among people.

Witkin explored two areas in his efforts to gain insight into the problem of perception. Using a comprehensive battery of personality tests including the MMPI, Sentence Completion, Figure Drawing Test, and supplementing these with a clinical interview, an autobiography, and Rorschach, he was able to construct an extensive personality analysis of each subject. This was necessary since he recognized that performance on the perceptual tests would not show a relation to all aspects of personality organization. In this way the relevant variables were determined.

The second area Witkin investigated to gain insight into the problem of perception was a study of perception at different stages of psychological development. This study yielded data, among other things, about the extent of changes in perception during development and the extent of sex differences in

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<sup>3</sup>Herman Witkin et al., Personality Through Perception (New York, 1954).

perception below the adult level. From the original group of children in the developmental study, he then drew a smaller group which consisted of fourteen boys and fourteen to sixteen girls in each group from the eight, ten, and thirteen year olds, for an intensive personality study.

Using Witkin's findings that the active coping with or passive acceptance of life situations is positively related to the way a person performs on the perceptual tests, the present study employed the Allport Ascendancy-Submission Reaction Study and the ascendancy scale of the Gordon Personal Profile to determine what relation, if any, there is between personality assessed in this manner and the embedded figures test.

In this investigation, eighth grade and senior high school boys and girls were selected to determine under the conditions of this experiment what relationships there would be between the perceptual task and the age and sex of the perceiver.

Though it was not intended when the study was conceived to include intelligence in the relationships sought, a number of preliminary testings suggested that a high relationship would be found. Therefore, data on intelligence was obtained. Resulting relationships between intelligence test scores and embedded figures test scores are presented.



The purpose of this investigation, then, is to study perception within the limits of this experimental situation, that is, to determine the relationship between a perceptual task, the ability to perceive a simple figure in a complex figure, and the age, sex, intelligence, and personality of the perceiver.

## CHAPTER II

### Background and Related Findings

#### Part I

#### Background

As was noted in the introduction, the study of perception has been approached, generally speaking, in either of two ways. These are described very well by Zuckerman<sup>1</sup> and by Postman and Bruner.<sup>2</sup> The first way is called the organizational approach by Zuckerman and the formalist by Postman and Bruner. It represents the influence of classic Gestalt theory, emphasizing the role of the structure of the prevailing field and innate organizing processes, and explaining perceptual experiences as determined by the outer world. Within the framework of this theory, experiments have been designed using few subjects and many observations in order to determine the nature and laws governing the structure of the given field. It seeks to establish the presence of innate

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<sup>1</sup>Carl Zuckerman and Irvin Rock, "A Reappraisal of the Roles of Past Experience and Innate Organizing Process in Visual Perception," Psychological Bulletin, LIV (1957), 269.

<sup>2</sup>Jerome S. Bruner and Leo Postman, "Perception, Cognition and Behavior," Journal of Personality, XVIII (1950), 14.

organizing processes in the organism rather than to appeal to learning and past experience to explain difficult problems in perception. Consequently, any individual variations within this framework were to be suppressed and experiments were inadvertently if not specifically designed to do so.

The development of this theory along the lines it followed and the efforts to extend certain aspects of it to the neglect of others is understandable in the light of the period during which it came into being. Wertheimer, although he included the personal factors of "set" and "past experience" in his laws of organization of perceptual experiences, ignored them to a great extent and set the pace for research done almost exclusively to determine the role of field factors in perception.<sup>3</sup> His attitude and that of Gestalt theory reflected a reaction against the elementarism of structural psychology which appealed to past experience as an exclusive determinant of psychological organization.

On the other hand, the second approach, called empiristic by Zuckerman and functionalist by Postman and Bruner, seeks to explain perception by studying the nature and combination of the stimuli giving rise to the perceptual experience. Consequently, emphasis is placed on the specific operations of the sense organs and associated neural structures mediating the stimuli. The basic assumption underlying empiristic theory seems to be a

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<sup>3</sup>Witkin et al., p. 495.

one-to-one relationship between local stimulation and the resulting sensory experience. Since there is a frequent discrepancy between the stimulus on the sensory surface and the actual percept, as in size constancy, for one example, the empiristic theory calls upon past experience with the same stimulus situation to explain the resulting percept, thus emphasizing the role of learning.

Koffka would reduce the issue to that between vitalism and mechanism making Gestalt theory a champion of vitalism.<sup>4</sup> He believes that when psychologists fail to accept vitalism they deal with man as a machine "postulating copious morphological connections . . . which act as mechanical devices conducting nerve excitations to their proper places terminating in processes which directly correspond to phenomenal vision. These fixed connections must force each excitation into its appropriate pathway to remain there until it reaches its destination . . . (the) percept would correspond to the stimulus in a one to one fashion."<sup>5</sup> Whenever past experience was used as an explanatory principle for certain problems in perception, Koffka had retorted that no one could doubt that past experience can be used to explain

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<sup>4</sup>Kurt Koffka, "Some Gestalt Problems," A Source Book of Gestalt Psychology, ed. Willis D. Ellis (New York, 1938), p. 55.

<sup>5</sup>Ibid., 56.

perception in some cases but that to use this factor to explain all perception is sure to fail.<sup>6</sup> Gottschaldt set out to prove this statement.

Gottschaldt<sup>7</sup> devised his now classic experiment with the stated purpose of studying the influence of past experience upon the perception of visual forms. Gottschaldt, in setting the stage for his experiment, said that the appeal in psychology to "past experience" as an explanatory concept is that it is an executive factor capable of modifying subsequent perception in a specific manner. For example, past experience would cause the segregation of abc from abcde even when abcde would not otherwise have been apprehended in this way. This appeal, he says, gives rise to such questions as the effect that past experience as a dynamic factor has upon the perception of figures, whether past experience is able to exert modifying effects upon any and all figures, or whether there are some whose internal unity or cohesion is such that past experience is powerless to affect them.

In order to study the problem Gottschaldt designed his experiment to study the influence an earlier experience of visually perceived form would have on a subsequent experience in view of the number and the type of antecedent experiences as well as the

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<sup>6</sup>Ibid., 58.

<sup>7</sup>Kurt Gottschaldt, "Gestalt Factors and Repetition," ed. Ellis, p. 109.

time elapsing between original presentation and the subsequent test.

The results of Gottschaldt's experiments led him to conclude that, within the range of his tests and under the conditions set forth, neither extreme increase of the number of previous presentations nor immediate sequence of a-b exposures was successful. Subjects with over 500 previous presentations did no better than those who had seen the a-figure but 5 times before the test was given. He explains his results in the light of Gestalt theory. The figural properties of the b-figures disclosed that the a-figures were psychologically not present in them. Even the greatest multiplication of "past experience" with the a-figures was incapable of offsetting the Gestalt factor whose force kept the b-figure from being "disrupted."

Gottschaldt summarizes that there are some perceptual situations where past experience in the sense of repetition is practically without effect as shown in his experiment. He further states that any appeal to "past experience" as an explanatory principle must be reorganized by its claimants so that it does not claim universality.<sup>8</sup> They must admit that other forces can play a principal role and do influence the object in question by depending on the organizational conditions of the perceptual

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<sup>8</sup>Ibid., 113.

field itself; and that these forces are determined by the intrinsic properties of the stimulus object.<sup>9</sup>

Kohler hailed Gottschaldt's findings as conclusive with the triumphant words:

After these results whoever defends the automatic influence of experience on our seeing definite forms will have incumbent on him the task of supporting his theory by other experiments.<sup>10</sup>

Many accepted the challenge. Moore<sup>11</sup> criticizes Gottschaldt from the standpoint that his experiment was less a test of the role of past experience than a test of methods of destroying similarities in isolated figures. Further, when Gottschaldt concludes that past experience does not determine perception, Moore would substitute the words "repetition" or "frequency of viewing" for the words "past experience." He concludes that Gottschaldt left the question exactly where he found it.

Henle<sup>12</sup>, using letters and their mirror reversals, devised an experiment which consisted in the presentation and reproduction of these two types of figures. The effect of past experience

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<sup>9</sup>Ibid., 114.

<sup>10</sup>Wolfgang Kohler, Gestalt Psychology (New York, 1929), p. 208.

<sup>11</sup>M. G. Moore, "Gestalt vs. Experience," American Journal of Psychology, XLII (1930), 454.

<sup>12</sup>Mary Henle, "An Experimental Investigation of Past Experience as a Determinant of Visual Form Perception," Journal of Experimental Psychology, XXX (1942), 21.

would be demonstrated by a greater frequency of positive perceptions of letters over reversed letters. She concludes that (1), letters were perceived positively significantly more frequently than their mirror reversals by subjects familiar with the letters and, that, (2), the structural equivalence of letters and reversed letters, studied under control experiments, showed that structural differences between letters and their reversals was not responsible for the difference in readiness of perception between them.

Opposed to the organizational approach and an able protagonist for the empiristic approach, D. O. Hebb, in his second chapter of The Organization of Behavior, has outlined an empiristic theory of perception which, he says, will "remove the necessity of accepting field theory."<sup>13</sup> He sets the stage for his theory, which he styles as mechanistic, in his introduction, where he rejects vitalism as wholeheartedly as Koffka espouses it. He speaks of a danger of ". . . a relapse into the vitalism and indeterminism of traditional thought . . ."<sup>14</sup> He believes that behavior and neural function are perfectly correlated and that some day psychologists will find out how to reduce behavior to the control of the brain since there is no ". . . soul or life-force

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<sup>13</sup>Donald O. Hebb, The Organization of Behavior (New York, 1949), p. 18.

<sup>14</sup>Ibid., xiii.



to stick a finger into the brain now and then and make neural cells do what they would not otherwise."<sup>15</sup>

Wertheimer<sup>16</sup> performs the same courtesy for Hebb that Moore, Henle, and others performed for Gottschaldt. He criticizes Hebb's second chapter on perceptual theory from three standpoints: (1), the unreliability of its sources; (2), the observational difficulties confronting the physician; and, (3), the difficulties of interpreting the observations reported. Particularly, he dwells on unreliability of Hebb's sources. Senden himself was fully aware of the limitations of his data and cautions against drawing too definite conclusions. Wertheimer pursues this fact when he notes that Hebb also recognized the limitations of this work but still, in the same breath, considers it "basic to his argument." Perhaps the most devastating of Wertheimer's criticism comes when he analyzes Hebb's interpretations of Senden's work. He concludes that Hebb's use of this material as fundamental to his argument is unfortunate since its equivocality introduces a difficulty in Hebb's discussion of perception, an interpretation having wide influence among psychologists today.

From each of these approaches, then, voluminous research has emerged. The literature abounds with examples of the experiments

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<sup>15</sup>Ibid.

<sup>16</sup>Michael Wertheimer, "Hebb and Senden on the Role of Learning in Perception," American Journal of Psychology, LXIV (1951), 133-137.

and analyses by proponents and opponents of each of these two theories which provide a basis for the present investigation. In studying the literature, one can learn much about the role played by the structure of the field and innate organizing processes on the one side and of sensory and neural processes influencing perception on the other. Yet, in spite of the amount of research done in this field, contemporary understanding of why things look as they do is incomplete, and the issues raised between the two main approaches to the study of problems of perception remain unresolved.

A dissatisfaction with this state of affairs along with a growing concern over a disturbing factor in the experimental study of perception which has hitherto been overlooked or deliberately ignored, namely, the persistent appearance of individual differences, has become more and more evident as one progresses through the literature and comes upon the present decade of research. The recognition of this problem of individual differences has led to a redesigning of experiments in an effort to bring out for inspection these disturbing factors rather than suppress them as irrelevant.

Following the present trend of seeking to establish a relationship between mode of perceiving and personal factors, Witkin and his colleagues report what they represent as an experimental and clinical study under the title Personality Through Perception. Though some regard the questions as to whether perception is a

native ability or acquired by past experience as stock questions not well-framed for experimental purposes<sup>17</sup>, Witkin seems to think that they are of vital importance to an experimenter. He believes that his study is rooted in both Gestalt theory and past experience theory with modifications and implications for both. Briefly, in the particular situations he used, he made an intensive study of the field factors contributing to perception. A series of experiments determined how variations in the structure of the visual field made for differences in perception as indicated by differences in average results. The nature of the perceptual tasks used in the study, then, always occupied a position of utmost importance. Findings showed that perception is significantly determined by the situation used. In standardizing his tests, he found that variations, determined by personal factors, fell within a determinable range in each field situation presented. Hence, he agreed with Gottschaldt that patterns of a given structure are more effective than patterns of another structure in "hiding" the figures they contain. But more important, he concluded that the results of his study demonstrated that the perceptual process in this task, could not be fully understood in terms of the structure of the field alone. The finding that some people adhere more than others to the obscuring pattern of the

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<sup>17</sup>Robert S. Woodworth and Harold Schlosberg, Experimental Psychology (New York, 1954), p. 403.

complex figures led him to consider the importance of individual differences and past experience in reporting results in perceptual tasks.

Witkin found that his studies corroborate Gestalt theory that the structure of the prevailing field does influence perception. However, in keeping with a second important theory of perception with its emphasis on the operation of sense organs and associated neural structures and the role of past experience in organizing perceptions, Witkin shows that there are wide individual variations which cannot be accounted for merely on the basis of the structural field but that the past experience of the individual must be taken into consideration. Here Witkin makes a distinction which is a departure from the customary interpretation of past experience. Past experience for him does not mean repeated experience with the same stimuli but rather all the past experiences of the individual which have gone into the composition of his characteristic coping with situations.

## Part II

### Use of Embedded Figures as Perceptual Tasks in Experimentation

The first use of the embedded-figure in a perceptual test was, of course, the classic experiment of Gottschaldt. He devised his embedded figures to determine the extent to which past experience plays a part in perception. He discovered as a supplement to his main conclusions that ability to perceive embedded figures is related to the set of the individual. This would be in keeping with Gestalt theory. What Gottschaldt failed to do was to take the next logical step to determine if this ability is related to an enduring set of the individual. This is understandable since the purpose of this experiment was to refute conclusively the claims of those explaining perception solely in terms of past experience. The set of the individual is admitted by Gestalt theory but is subordinated to other laws of perceptual organization and relegated to obscurity as far as material for research is concerned.

Braly (1930) and Djang (1937), following Gottschaldt, have employed embedded figures as perceptual tasks more with the view to determining the importance of past experience or structure of the field in influencing perception.

There have been few experiments using embedded figures which have followed the present trend of seeking to establish a relationship between mode of perceiving and personal factors.

Thurstone in an elaborate exploratory study tests the hypothesis that through an exhaustive study of perceptual functions one may isolate a number of factors which make up perception and which may eventually reveal central determination which with analysis may disclose a number of personality parameters built up through the physical reaction system of the individual.

The purpose of Thurstone's study as stated in the preface was "discovering whether the many perceptual effects that have a dynamic character and that are central rather than ocular in nature are associated by functional unities that might be identified factorially."<sup>18</sup> He describes his study as exploratory but notes that in this study he has found a clear indication of the existence of several factors in perceptual dynamics. He does not attempt to name these factors, giving as his reason that not enough is known in a single study to do so.

The hypothesis on which he builds his study is that perception as a function of a person is not isolated from the rest of the dynamical system that constitutes the person.<sup>19</sup> He believes

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<sup>18</sup>L. L. Thurstone, "A Factorial Study of Perception," Psychometric Monographs, IV (1944), 111.

<sup>19</sup>Ibid.

that in studying the function of perception he might uncover some parameters which can be differentiated. They will appear first as factors of the function of perception and may eventually be identified with physiological mechanisms. After identifying these factors, he would see what association there is between them and the observable characteristics of people.

In his study Thurstone used a complete test battery of sixty perceptual tests in his efforts to identify factors. A few examples of the more familiar are the Street Gestalt Completion, Autokinetic Movement, Brightness Constancy, Necker Cube, Size Constancy, Reaction time to both light and sound, Flicker fusion, Sanders illusion, Poggendorff Illusion, Müller-Lyer Illusion, Gottschaldt Figures.<sup>20</sup> The last named is the task in which the present study is interested.

All the original Gottschaldt figures were reproduced. Since it seemed that the simpler figures involved functions different from the more difficult figures, the test was divided into two parts, A and B. In both tests A and B, the simple figures was presented at the same time as the complex figure and the subject was asked to trace the given figure. Scoring differed in the two tests. In the Gottschaldt A, the number of designs completed in the time allotted was the score. In Gottschaldt B, the score was the number of designs completed per minute of time. In further

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<sup>20</sup>Ibid., 8.

investigations, Thurstone combined the two scores into a single score since the factorial composition of the two parts seem to be the same. He found that the Gottschaldt tests were high in saturation on Factors A and E.<sup>21</sup> Factor A seems to represent the ability to form a perceptual closure against distraction. It also seems to point to ability to form a closure out of an unorganized presentation. The factor A also seems to be concerned with the strength of the configuration. The saturation of Factor A on Test A is .51 and Test B is .44. In describing Factor E, Thurstone says that it implies flexibility in manipulating conflicting configurations. Reasoning tests of the Primary Mental Abilities test also are loaded with factor E relating it as a possible important aspect of intelligence. Factor loadings for Gottschaldt A are .40 and Gottschaldt B .34.<sup>22</sup>

Thurstone notes that his Gottschaldt Figures test represents one of the best examples of a task in which a subject must destroy a given configuration in order to form another one. He considers that ability to destroy a given Gestalt is representative of a factor. He describes the task as requiring the subject to disregard perceptually the configuration so as to reveal or discover the part figure.

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<sup>21</sup>Ibid., 101.

<sup>22</sup>Ibid., 111.



In approaching this study, Thurstone believes that it would be better to use a few subjects who have a conspicuous perceptual performance characteristic and some subjects who do not. Following this would be the task of noting how these subjects differ in movement and temperament.<sup>23</sup> In other words, he would proceed directly to fundamental dynamical characteristics of a person without regard to the socially differentiable behavior determined by that system. After an intensive study of the perceptual system, the results might be correlated with a personality questionnaire.

Upon this hypothesis, Thurstone included in his factorial study an investigation which he identifies as merely suggestive of further study.<sup>24</sup> He chose eighteen men identified as leaders on a university campus. Their leadership depended on personal contact with other students. They were submitted to the battery of perceptual tests to see if their performance differentiated them from the original group of volunteers. The results were dealt with by the chi-square technique. The chi-square represents the degree of differentiation from the subjects in the volunteer study. Some perceptual tasks showed a greater degree of differentiation than others. The highest differentiating tests were the Ehrenstein square Illusion, size-weight amount,

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<sup>23</sup>Ibid., 2.

<sup>24</sup>Ibid., 130.

brightness contrast, reaction time to light and the Sanders Illusion. Gottschaldt A ranked about twelfth out of the forty-four tests--some tests had been eliminated for their low factor loadings and inter-correlations--in its differentiating value, and Gottschaldt B was much lower. Gottschaldt A showed a chi-square of +1.80 and Gottschaldt B showed a chi-square of +.17.

Anastasi<sup>25</sup> speaks of "artificial task" tests and recognizes them as relatively structured and disguised. She mentions a number of studies using artificial tasks. McKinnon<sup>26</sup>, mentioned by Anastasi, includes in the tests in his battery of fourteen perceptual and cognitive tasks the identification of geometrical figures embedded in more complex designs. These are taken from the original Gottschaldt figures. Suggestive correspondences were found between scores and criterion ratings. Anastasi sounds a warning note, however, that these studies are in a preliminary, formative, experimental stage. Anastasi comments that such a test shows promise as an approach similar to that of projective techniques and may be regarded as projective. She says, however, that they are more highly structured.

In view of Anastasi's remark that geometrical figures are highly structured and, in line with a discussion of such figures,

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<sup>25</sup>Anne Anastasi, Psychological Testing (New York, 1957), p. 649.

<sup>26</sup>Ibid., 650.

it is interesting to review Gibson's untraditional view of geometrical figures. He points out that geometrical forms are not necessarily to be considered as unique and mutually exclusive. Nor are they rigid but rather can be considered as a "kind of plastic material capable of being moulded into the most varied forms." Gibson suggests that instead of considering visual forms according to the traditional manner imposed on us by the Greeks and following Aristotelian logic which sets objects into classes of individual things, in this case triangles, squares, circles, we serialize instead of classify. Thus we can see that each form could differ gradually and continuously from every other form. Any form can be transformed gradually into another form. Gibson does not discuss the geometrical forms in relation to the personality. He is attempting to show a psychophysical relation between retinal and perceived shape. Nor is he interested in whether a dynamical brain process or an interpretative brain process should be used to explain why the retinal image does not correspond to the perception of the outside world or that perception is not a copy of the retinal image. Nevertheless, Gibson's discussion of form and a knowledge of the transformations which geometrical figures can undergo may be revealing. Such figures may prove to be valuable tools in the experimentation which follows the present trend of studying perception within the framework of the perceiver. Since materials used in experiments have been known to influence perceptual responses due to factors of

value and need, responses to such materials could vary in an uninterpretable way. Geometrical figures represent a neutral starting point for eliciting responses. Yet they are merely standards of reference and not entities of shape. Hence, it is plausible that the perceiver might mold them in characteristic ways yet to be empirically established.

Witkin in preparation for incorporating the embedded figures test into his battery of perceptual tests, submitted it to a thorough investigation as a perceptual task.<sup>27</sup> The embedded figures test uses the original Gottschaldt figures developed for his study of the role of past experience in perception. Witkin added more figures so that his test consists of twenty-four complex figures each of which contains a simple figure. The simple figure is hidden by the use of lines to obscure the contour. Many lines of the complex figure incorporate the simple figure into a number of prominent subpatterns in the complex figure. Thus each side of the simple figure becomes the boundary of another pattern, each subpattern tending to draw attention away from the simple figure. Witkin, to make the task still more difficult, used colors in his complex figures. These colors were employed so as to emphasize the subpatterns and obscure the simple figure.

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<sup>27</sup>Herman Witkin, "Individual Differences in Ease of Perception of Embedded Figures," Journal of Personality, XIX (1950), 1-15.

The subject in the experiment is first shown the complex figure, then the simple figure, and again the complex figure. He is instructed to find the simple figure in it. The simple figure and the complex figure are not shown together but the subject is free to ask to see the simple figure as many times as he wishes. In using this procedure, Witkin points out that the task should not be one of memory but of perception. These representation times are not included in his score which is the mean time taken to find the simple figures in the complex ones. This is supposed to provide a measure of the extent to which his perception is influenced by the context in which the item occurs.

In this study, Witkin, using 51 men and 51 women, found a striking range of differences between subjects in the ease with which they discover the simple figure. Women were found to take considerably longer than men. In analyzing each figure used, Witkin discovered that the structure of the figure tended to influence perception and that some figures were more difficult to break up than others; but that for the most part women showed higher mean scores on each figure than men. For example, for Figure A-1, the mean time in seconds was 62.8 with three failures and for women the mean time in seconds was 129.9 with 9 failures. The fact that the structure of the field, that is the figure, does influence perception is true according to Witkin's findings. He found further that people tend to be self-consistent in the ease with which they escape the influence of the complex pattern

or the influence of the field. That is, if a given figure receives a higher mean time than a second figure, a person who tended to score higher than the mean time on the figure that was easier to break up will also tend to score higher than the mean on the second more difficult figure. Witkin correlated the even presentations of test figures with the odd presentations. The correlation shows a reliability of .87 for men and .74 for women.

Witkin concludes that the structure of the task or visual field influences a person's perception but that the degree of facility in perceiving a part within a larger visual structure is a persistent characteristic of each individual, that some individuals can break away from field factors more readily than others, and that people differ markedly in this respect.

After his preliminary thorough investigation of the embedded-figures test as a perceptual task, Witkin went on to discover its relationship to the main tasks of his perceptual battery. In his analysis of his orientation subtests he found that successful performance on these depended on the subject's ability to deal with the task analytically, that is, to separate the item from the field. For example, in his rod-and-frame test the subject must disregard the tilted frame in order to bring the rod to a true vertical; or in the tilting room-tilting chair test, he must ignore the tilted room in order to adjust his body to a true upright. Witkin devised the embedded figures test to discover "whether a given degree of ability to deal with an item

independently of its surroundings is a pervasive characteristic of a person's perception."<sup>28</sup>

Twenty-six correlations between the embedded-figures tests, relating tests results for men and women separately, and the orientation tests with their respective number of series, show that 16 are significant at the 1 per cent level and three at the 5 per cent level. Further, all of the men's correlations were significant at either the 1 per cent or 5 per cent level. Six of the women's were significant all at the 1 per cent level. Of the women's none of the correlations with the red-and-frame were significant, with one correlation as low as .03.<sup>29</sup>

Thirty-two men and 30 women of the original 46 men and 45 women were retested in the embedded figures test three years later. There was a significant decrease in mean time scores but the test-retest correlations were .89 for the men and .89 for the women.

In defining the nature of the perceptual task in the embedded figures test, Witkin points out two important features. The task is a part of a field type and directly forces the subject into activity rather than passive acceptance as some of the body adjustment series permit. The pressure to separate the item

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<sup>28</sup>Witkin et al., Personality Through Perception, p. 83.

<sup>29</sup>Ibid., 85.

from the field is greater than in any of the orientation tests since the subject knows immediately whether he has succeeded or failed.<sup>30</sup>

Further, the embedded figures task involves a unitary perceptual system concerned only with a field and an item in it and not to any standard outside. In this it is related to the body-adjustment series of each of the tasks. Hence, one would expect to find closer correlations between the embedded figures and body adjustment.

After establishing relationships between the embedded figures test and the other tasks of his perceptual battery, Witkin shows its relation to the personality battery. Representative of the type of correlations found are the correlations between the embedded figures and the Rorschach summed scores. Correlating the introspective score with the embedded figures test score, Witkin finds a correlation of .44 for men, significant at the 1 per cent level of confidence and .29 for women significant at the 5 per cent level. On the coping score, Witkin finds for men .39 significant at the 1 per cent level and .32 for women significant at the 5 per cent level. For the total score, the correlation for men is .51 and for women .37, both significant at the 1 per cent level.<sup>31</sup> The correlation between embedded figures test

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<sup>30</sup>Ibid., 86.

<sup>31</sup>Ibid., 219.



scores and the Figure Drawing test were .62 for men and .56 for women, both significant at the 1 per cent level of confidence.<sup>32</sup> Correlations between the embedded figures scores and the lack-of-self-assertiveness scores on the TAT were .36, significant for men at the 1 per cent level, and .10, not significant for women.<sup>33</sup>

Witkin's developmental study of perception will be reported later in connection with the results of this investigation. The results, briefly, at this point, show that there is a development in perception as age increases, that the difference is most striking between the ages of 10 and 13 with a marked decrease in dependence on the field and with a subsequent return to dependence on the field beginning in girls at 15 years of age and boys at about 17 years of age with the final conclusion that adults are generally less field dependent than the 8 and 10 year-olds but that they were generally more field dependent than the 15 and 17 year-olds.

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<sup>32</sup>Ibid., 247.

<sup>33</sup>Ibid., 274.

## CHAPTER III

### Procedure of the Experiment

#### Subjects

Fifteen boys and fifteen girls between the ages of thirteen years five months to fourteen years five months were chosen from a lower middle class grade school. From a high school in the same area, fifteen boys and fifteen girls between the ages of seventeen years five months to eighteen years five months were chosen. A total group of sixty children was used.

#### Materials

Embedded figures--identical in some cases to the original Gottschaldt figures, modified in some cases by Witkin--were reproduced from Witkin's experiment on 3 x 5 white cards. There were twelve cards containing the complex figures with the simple figures concealed in them. The simple figures were reproduced each on a separate card. Some of the simple figures were used more than once, being concealed in more than one complex figure. Witkin, in standardizing his test, used twenty-four figures. In correlating the even test figures with the odd test figures, he found a reliability of .87 for men and .74 for women. This

indicated a consistency of performance throughout the test. In a few preliminary runs in the present investigation, it was found that the length of the test caused great fatigue, eye strain, and headache with a developing negativistic and discouraged attitude toward the test noted in those who failed and who, because of the nature of the task, were aware of their failure. These handicaps resulted even in spite of the usual precautions to forestall fatigue by rest periods every third trial. In view of these facts and of the previous description of consistency of performance on the entire test, it was deemed a legitimate procedure to cut the test down by using only the odd numbers of test figures.

Since the relationship between intelligence and the embedded figures test was considered supplementary, an intelligence test was sought which would be sufficiently reliable for the purpose of ranking, but one which would require the least amount of time and effort both in administering and scoring. The Otis Quick-Scoring Mental Abilities Test was suggested to this investigator. The Gamma form was used for the older children, the Beta form for the younger. Because the Otis test is known to handicap the performance of poor readers, this investigator administered the Revised Stanford-Binet scale to those children who showed marked reading deficiency.

The Personality tests used were the Allport Ascendancy-Submission Reaction Study and the Gordon Personal Profile.

The Otis mental test and the two personality tests were given as group tests. The instructions in the respective manuals were adhered to. These were followed by the embedded figures test which was given individually to each subject on successive days following the group tests. Again, the instructions in the original experiment of Witkin<sup>1</sup> were adhered to. The embedded figures test consisted of twelve trials. On each trial a different complex figure was presented. The presentation of figures was made in random sequence as given in the Witkin experiment. The same sequence was used for each subject.

The subject was seated at a table with the experimenter.

The subject was instructed as follows:

I am going to show you a series of designs. Each time I show you one of these designs I want you to describe the over-all pattern that you see in it. After you examine each design, I will show you a simpler figure, which is contained in that larger design. You will then be given the larger design again, and your job will be to locate the smaller figure in it. Let us go through one to show you how it is done.

(S is shown the practice complex figure (P-1) for 15 seconds. Then, after it is removed, he is shown the practice simple figure (P) for 10 seconds. When it is removed, the practice complex figure is shown once more and timed. The score recorded was the time taken to locate the simple figure. When he reported finding the figure, he was required to trace it, so that E could be sure it was correct. Then the instructions were continued.)

This is how we will proceed on all trials. I would like to add that in every case the smaller figure will

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<sup>1</sup>Witkin, Journal of Personality, XIX, 10.

be present in the larger design. It will always be in the upright position. There may be several of the smaller figures in the same large design, but you are to look only for the one in the upright position. Work as quickly as you possibly can, since I will be timing you; but be sure that the figure you find is exactly the same as the original figure both in size and in proportions. As soon as you have found the figure, tell me at once. If you ever forget what the small figure looks like, you may ask to see it again. Are there any questions?

The complex figure was shown for 10 seconds. Then the simple figure was shown for 15 seconds. Next the complex figure was shown until the subject located the figure or until he asked for a re-presentation of the simple figure. After three minutes were up, the trial was considered a failure and the next figure was shown.

### Scoring

The subject's score was the mean time in seconds for locating each figure. If the subject asked to see the simple figure the watch was stopped and this re-examination was not included in the total time. When the subject reported finding the figure, if the tracing of it was correct, his score was the number of seconds up to and not including the time of tracing. If his tracing was incorrect, the tracing time was added to the total time and the test continued until a correct tracing was made. As in Witkin's experiment, the number of re-presentations was not taken into account in the scoring. The score, then, was the mean time in

seconds to locate a simple figure in a complex figure including the incorrect tracings but not the re-presentation times.

## CHAPTER IV

### Results

Table 1<sup>1</sup> shows the means and standard deviations of all groups. Inspection of the table shows a number of sex differences. Senior boys show a mean score of 34.8 seconds while senior girls show a mean score of 53.1. This is a difference of 18.3. The lower mean time score suggests superior ability on the part of the boys to deal analytically with the field in separating the simple figure from the complex figure. However, this difference is not significant, the  $t$  value being 1.664. The senior girls show a greater variability than the senior boys with a range of 120.0 as compared to the boys' range of 73.0. The highest score for boys is 6.7 as compared to the girls' high score of 13.2. The lowest score for boys is 79.7 with a low score for girls of 134.0. For the whole series of figures, there were 19 failures for boys as compared to 29 failures for girls in discovering the simple figure in the complex figure in the time allotted.

For the eighth grade group, boys have a mean time score of 70.9 as compared to the girls' mean of 73.9. The boys show a

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<sup>1</sup>Table 1, p. 36.

Table 1  
Means, Standard Deviations, and Range  
for Embedded Figures Test Scores for All Groups  
(N= 15 for each group)

Group	Mean	S.D.	Range
Senior Boys	34.8	21.1	73.0
Senior Girls	53.1	31.2	120.0
Eighth Grade Boys	70.9	40.0	114.6
Eighth Grade Girls	73.9	40.7	156.9



Table 2

## Scores and Ranks for

Embedded Figures, Allport Ascendance-Submission Scale,  
and the Ascendance Scale of the Gordon Personal Profile  
(Senior Girls)

S	Score on Embedded Figures (Sec.)	Score on Allport Scale	Score on Ascendance Gordon Profile	Rank Embedded Figures	Rank Allport	Rank Gordon Profile
G-26	134.0	+13	+ 5	1	10	5
G-18	98.8	-15	+ 3	2	2	3.5
G-19	83.4	+ 3	+ 6	3	8	8.5
G-27	62.8	+15	+ 6	4	11.5	8.5
G-16	61.8	+ 1	+ 6	5	5	8.5
G-20	54.1	+16	+ 7	6	13	12.5
G-28	51.6	+22	+ 9	7	14	14
G-25	48.6	+ 4	+14	8	9	15
G-24	41.2	-11	+ 6	9	3	8.5
G-30	40.5	-23	- 7	10	1	1
G-29	37.5	+ 2	+ 6	11	6.5	8.5
G-17	23.7	+15	+ 6	12	11.5	8.5
G-22	22.9	+30	+ 7	13	15	12.5
G-21	22.5	- 5	+ 1	14	4	2
G-23	13.2	+ 2	+ 3	15	6.5	3.5

Table 3

## Scores and Ranks for

Embedded Figures, Allport Ascendance-Submission Scale,  
and the Ascendance Scale of the Gordon Personal Profile  
(Senior Boys)

S	Score on Embedded Figures (Sec.)	Score on Allport Scale	Score on Ascendance Gordon Profile	Rank Embedded Figures	Rank Allport	Rank Gordon Profile
B-27	79.7	+19	- 1	1	10	4
B-18	65.5	+ 3	+ 3	2	7	7
B-29	62.6	-42	- 2	3	1	3
B-28	55.1	+45	+16	4	14	15
B-25	54.0	-12	-10	5	3	1
B-20	39.3	+ 9	+ 6	6	8	8.5
B-17	36.2	+43	+ 9	7	13	12
B-26	28.0	+47	+14	8	15	14
B-16	25.2	+28	+11	9	12	13
B-24	24.5	+15	- 5	10	9	2
B-22	15.2	+22	+ 8	11	11	11
B-19	14.1	0	+ 2	12	5.5	5.5
B-30	9.3	0	+ 6	13	5.5	8.5
B-23	8.3	- 1	+ 7	14	4	10
B-21	6.7	-13	+ 2	15	2	5.5

superiority in ability to separate the item from the field, though the difference in mean is not statistically significant. The variability within the groups seems the same but the girls' range of 156.9 is greater than that of the boys' range of 114.6. The highest score for boys is 18.3 as compared to the girls' 23.1. The lowest score obtained by boys was 134.9 as compared to 180.0 for girls. For the whole series of figures there are 44 failures for boys as compared to 51 for girls.

Results show that boys in this investigation are superior in ability in separating a simple from a complex figure though the difference is not significant. Inspection of the table shows a greater difference between boys and girls in the senior group than in the eighth grade group. Differences between the sexes become greater as the adult level is approached. These results agree with Witkin<sup>2</sup> who found that males show superior ability in separating a simple figure from a complex figure. Further there are only small differences between sexes which tend toward significance at the seventeen-year level. At the adult level the differences become consistent and significant.

To compare age groups, information from Table 1 is used. Senior boys show a mean score of 34.8 as compared to eighth grade boys with a mean of 70.9. The difference is statistically

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<sup>2</sup>Witkin et al., Personality Through Perception, p. 170.

significant at the 2% level of confidence. Senior boys show a significantly better ability to separate a simple figure from a complex figure. The eighth grade boys show a greater variability than the senior boys and have a range of 114.6 as compared to the senior range of 73.0. Table 3<sup>3</sup> shows that the highest score for the senior boys is 6.7 as compared to the eighth grade boys' highest score of 18.3 shown in Table 4<sup>4</sup>. The low score for seniors is 79.7 with a low score for eighth grade boys of 132.9. For the whole series, seniors failed in nineteen instances to discover the simple in the complex figure as compared to the eighth grade with 44 failures.

For the difference in age groups for girls, the seniors have a mean of 53.1 as compared to the eighth grade mean of 73.9. The difference in the means is 20.8 and is not significant. The older group shows greater ability to separate the simple from the complex figure but results do not show them to be significantly better. The eighth grade girls show a greater variability with a range of 156.9. The senior girls' range is 120.8. The highest score for senior girls, shown in Table 2,<sup>5</sup> is 13.2 as compared to the eighth graders high score of 23.1 shown in Table 5<sup>6</sup>. The

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<sup>3</sup>Table 3, p. 38.

<sup>4</sup>Table 4, p. 41.

<sup>5</sup>Table 2, p. 37.

<sup>6</sup>Table 5, p. 42.

Table 4  
Scores and Ranks for  
Embedded Figures, Allport Ascendance-Submission Scale,  
and the Ascendance Scale of the Gordon Personal Profile  
(Eighth Grade Boys)

S	Score on Embedded Figures (Sec.)	Score on Allport Scale	Score on Ascendance Gordon Profile	Rank Embedded Figures	Rank Allport	Rank Gordon Profile
B-2	132.9	+ 5	+ 2	1	11.5	8.5
B-12	124.2	- 9	- 5	2	6	3
B-9	122.6	- 8	+ 8	3	7	13
B-14	114.6	- 6	+ 9	4	8	14
B-13	99.2	- 3	+ 3	5	10	10
B-8	82.9	-14	+ 6	6	4.5	11
B-7	78.9	+30	- 2	7	15	4
B-5	77.2	-32	0	8	2	6
B-4	66.3	-14	+ 7	9	4.5	12
B-11	35.9	+24	+13	10	14	15
B-10	33.3	- 5	+ 2	11	9	8.5
B-1	30.2	-39	-10	12	1	1
B-15	27.5	+ 5	- 8	13	11.5	2
B-3	20.4	-16	- 1	14	3	5
B-6	18.3	+16	+ 1	15	13	7

Table 5  
Scores and Ranks for  
Embedded Figures, Allport Ascendance-Submission Scale,  
and the Ascendance Scale of the Gordon Personal Profile  
(Eighth Grade Girls)

S	Score on Embedded Figures (Sec.)	Score on Allport Scale	Score on Ascendance Gordon Profile	Rank Embedded Figures	Rank Allport	Rank Gordon Profile
G-10	180.0	- 4	+ 5	1	11	11
G-12	118.4	-16	+ 3	2	5	7.5
G-15	105.1	-22	- 3	3	2	1.5
G-11	98.5	-30	- 3	4	1	1.5
G-6	98.1	+ 4	+ 7	5	12	13
G-3	86.5	-10	0	6	9	5.5
G-4	86.3	+ 9	+ 8	7	14.5	14.5
G-5	54.7	-16	0	8	4	5.5
G-14	52.4	-15	+ 5	9	6	11
G-13	52.2	-10	+ 5	10	9	11
G-2	50.9	-12	- 1	11	7	3.5
G-1	37.5	-17	+ 4	12	3	9
G-8	36.6	+ 9	+ 3	13	14.5	7.5
G-9	28.1	-10	- 1	14	9	3.5
G-7	23.1	+ 7	+ 8	15	13	14.5

Table 6  
Mean Age and Sex Differences and t s for Embedded  
Figures Test Scores

Group	Mean Difference	t
Between Senior boys- Senior girls	18.3	1.664
Between Eighth grade boys- Eighth grade girls	3.0	.181
Between Senior boys- Eighth grade boys	36.1	2.735
Between Senior girls- Eighth grade girls	20.8	1.382

lowest score obtained by the seniors was 134.0 as compared to 180.0 for eighth graders. For the whole series of figures there are 29 failures for the older girls and 51 failures for the younger group.

The data of this study show the superiority of boys over girls and older children over younger children in ability to separate a simple figure from a complex figure though the differences are not significant except in one instance. Witkin<sup>7</sup> plotted a developmental curve for perceptual tasks which represent ability to remain independent of the field. Being able to separate a simple figure from a complex figure represents such a task. Witkin's curve shows a gradual rise in perceptual ability from eight years to adulthood. The most dramatic improvement takes place between ten and thirteen years of age when children become markedly independent of the field in perceptual tasks. The ability continues to increase until fifteen years of age when both sexes are most alike. Then the girls begin a gradual but marked return to dependence on the field. The boys persist in their increase till about seventeen years of age when they begin an opposite trend toward a return to dependence on the field. Their return to dependence on the field is not as marked as the girls and, hence, it is that some time after this age, differences between the sexes become consistently significant.

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<sup>7</sup>Witkin et al., Personality Through Perception, p. 129.



Inspection of Table 6,<sup>8</sup> then, shows that in line with this developmental curve, the senior boys, reaching the peak of their perceptual abilities, are significantly better than the eighth grade boys in separating a simple figure from a complex figure. The senior girls according to their mean show superior perceptual ability but they are not significantly different from the eighth grade girls. This would bear out the finding that the girls reach their peak at about fifteen years of age and begin a return to dependence on the field. The findings in this study would be representative of the senior girls' downward trend to a level which would be more equivalent to their thirteen year level of ability.

Before results of rank-difference correlations between intelligence test scores and embedded figures test scores are discussed, attention is called to Table 9<sup>9</sup> showing means for each group on intelligence test scores. At first glance the notable differences between means of age groups calls into question the randomness of selection of subjects. However, it is the randomness of selection without taking cognizance of the fact that the average I.Q. of high school seniors is higher than that of eighth graders<sup>10</sup> that accounts for the marked difference. Generally

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<sup>8</sup>Table 6, p. 43.

<sup>9</sup>Table 9, p. 50.

<sup>10</sup>Sister Annette Walters and Sister Kevin O'Hara, Persons and Personality (New York, 1953), p. 325.

Table 7

Correlations for All Groups Between Scores  
On Embedded Figures Test and Intelligence Test  
(N= 15 for each group)

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Senior Boys	+ .35
Senior Girls	+ .33
Eighth Grade Boys	+ .79
Eighth Grade Girls	+ .30

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Table 8  
Scores and Ranks for  
Intelligence Test and Embedded Figures Test  
for Each Group

S	Score I.Q.	Score Emb. Fig.	Rank I.Q.	Rank Emb. Fig.	S	Score I.Q.	Score Emb. Fig.	Rank I.Q.	Rank Emb. Fig.
Eighth Grade Girls					Senior Girls				
G-2	86	50.9	1	11	G-18	82	98.8	1	2
G-10	90	180.0	2.5	1	G-27	101	62.8	2	4
G-15	90	105.1	2.5	3	G-24	102	41.2	3	9
G-8	98	36.6	4	13	G-29	105	37.5	4	11
G-6	101	98.1	5	5	G-20	108	54.1	5	6
G-11	102	98.5	6.5	4	G-16	114	61.8	6.5	5
G-14	102	52.4	6.5	9	G-17	114	23.7	6.5	12
G-9	105	28.1	8	14	G-26	115	134.0	8	1
G-12	107	118.4	9	2	G-23	117	13.2	9	15
G-4	110	86.3	10	7	G-30	118	40.5	10	10
G-13	114	52.2	11	10	G-21	119	22.5	11	14
G-5	116	54.7	12	8	G-19	121	83.4	12	3
G-1	119	37.5	13.5	12	G-28	125	51.6	13	7
G-7	119	23.1	13.5	15	G-25	128	48.6	14	8
G-3	121	86.5	15	6	G-22	131	22.9	15	13

Table 8 (continued)  
 Scores and Ranks for  
 Intelligence Test and Embedded Figures Test  
 for Each Group

S	Score I.Q.	Score Emb. Fig.	Rank I.Q.	Rank Emb. Fig.	S	Score I.Q.	Score Emb. Fig.	Rank I.Q.	Rank Emb. Fig.
Eighth Grade Boys					Senior Boys				
B-2	87	132.9	1	1	B-25	93	54.0	1	5
B-12	98	124.2	2	2	B-27	97	79.7	2	1
B-9	101	122.6	3	3	B-29	102	62.6	3	3
B-5	103	77.2	4	8	B-18	114	65.5	4	2
B-13	109	99.2	5	5	B-19	117	14.1	5.5	12
B-14	110	114.6	6	4	B-21	117	6.7	5.5	15
B-8	112	82.9	7	6	B-20	118	39.3	7	6
B-11	113	35.9	8	10	B-24	122	24.5	8	10
B-3	114	20.4	9.5	14	B-16	123	25.2	9.5	9
B-6	114	18.3	9.5	15	B-23	123	8.3	9.5	14
B-7	117	78.9	11	7	B-26	128	28.0	11.5	8
B-4	118	66.3	12	9	B-30	128	9.3	11.5	13
B-1	120	30.2	13.5	12	B-17	129	36.2	13	7
B-15	120	27.5	13.5	13	B-28	132	55.1	14.5	4
B-10	121	33.3	15	11	B-22	132	15.2	14.5	11

speaking the lower the I.Q., the sooner the individual drops out of school. By the time the senior year in high school is reached, those in the lower range of intelligence have discontinued their education.

Examination of Table 7<sup>11</sup> in considering the relation between embedded figure scores and intelligence test scores on the Otis test shows a positive rank difference correlation for all groups. The eighth grade boys have a rho of  $+ .79$ , significant at the 1% level. This would agree with other findings. Thurstone using adult subjects found correlations of  $+ .57$  and  $+ .51$  between scores for two Gottschaldt-figures tests and the Kohs Block-Design scores which are used to evaluate intelligence. He found further in his factor analysis that the Gottschaldt A test showed a loading of  $.40$  and Gottschaldt B test a loading of  $.34$  on factor E.<sup>12</sup> Reasoning tests of the primary mental abilities battery also show a heavy loading of factor E which suggests a relationship. Witkin, in a footnote, reports a preliminary study done in his laboratories by Woerner and Levine in 1951 to determine relationships between the Wechsler Intelligence Scale for Children and several of the perceptual tasks, among others the embedded figures test.<sup>13</sup> The study used thirteen boys and twelve girls of

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<sup>11</sup>Table 7, p. 46.

<sup>12</sup>Thurstone, p. 101.

<sup>13</sup>Witkin et al., Personality Through Perception, p. 477-8.

Table 9  
Means and Standard Deviations for Scores  
on the Otis Quick-Scoring Mental Abilities Test  
(N= 15 for each group)

Group	Mean	S.D.
Senior Boys	118.3	11.9
Senior Girls	113.3	12.0
Eighth Grade Boys	110.5	8.7
Eighth Grade Girls	105.3	10.9

twelve years of age. The correlation for the verbal scale is  $+.54$  for boys and  $+.57$  for girls, both significant at the 5% level. The correlation with the performance scale is  $+.88$  for boys and  $+.73$  for girls, both significant at the 1% level. For the full scale, the correlation is  $+.71$  for boys and  $+.74$  for girls both significant at the 1% level. In all but 3 of the 24 correlations between all perceptual tasks and intelligence, correlations were higher for girls than for boys.

It seems strange with such convincing evidence for the relation between performance on perceptual tasks and intelligence, that this factor is ignored in Witkin's work. It is not reported in the body of his material nor is there any mention in the discussion of his design that any effort is made to take account of intelligence as a related factor in this study. It seems to represent a flaw in method and suggests a further study in which the factor of intelligence be controlled.

On the other hand, as was noted, 21 out of the 24 correlations between the W.I.S.C. and the perceptual tasks for the thirteen year old group favored the girls. If intelligence is a related factor in manner of perceiving then the subsequent inter-correlations on the perceptual tasks and correlations of the perceptual tasks with personality measures should have favored the girls. This was noticeably not so. Boys in most instances were markedly favored in ability to remain independent of the field, which represents active coping techniques.

In view of this apparent paradox of results it is necessary to recall something of the interpretation of a score on an I.Q. test. Two persons may receive identical scores. Nevertheless, the manner in which they use this intelligence as quantified by a test score will show as many variations as there are persons who receive that same score. In other words, again it is the person who determines in what unique manner the intelligence as represented by a score is used. Witkin's study shows that differences in perceptual performance occur as early as the eight-year level. Hence, early in life, a child failing to cope actively with the environment may develop and adhere to a pattern of passively submitting. Thus, even in the use of intelligence there may be a pattern of either actively or passively approaching solutions to problems.

In spite of this possibility of a characteristic way of using intelligence, determined by the person, it would seem to be necessary, after noting the high relationship, to control the factor of intelligence.

Table 10<sup>14</sup> shows the results of correlations between embedded figure test scores and scores on personality tests. Spearman's Rank-Difference formula was used on all data. Correlations with the Allport A-S Reaction study show a rho coefficient of -.22 for senior boys, -.04 for senior girls, -.02 for eighth

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<sup>14</sup>Table 10, p. 53.



Table 10  
Correlations ( $\rho$ ) for All Groups Between Scores  
On Embedded Figures Test and Personality Scales  
(N= 15 for each group)

Group	Allport	Gordon
Senior Boys	-.22	+.35
Senior Girls	-.04	-.07
Eighth Grade Boys	-.02	-.12
Eighth Grade Girls	+.31	+.15

grade boys, and a  $+ .31$  for eighth grade girls.

In order to understand results which are the opposite of what was expected, it is necessary to study more closely the construction of the A-S Reaction Study and the relation of intelligence found in this study. Allport<sup>15</sup> discusses at length the traits of ascendance and submission. He believes that they should be placed on a continuum only for the sake of convenience. Submission he says, is not merely an absence of ascendance but rather a positive mode of adjusting to the environment. As a child matures he finds that he gains more satisfaction in agreeing, yielding to another's judgment, passively accepting another's ideas. Another child as he matures finds that he gains more satisfaction in constantly and actively dominating those around him. The two are separate traits representing two types of personality organization. He believes further that by the very nature of our culture, that of a competitive society, each individual is forced to seek his own level of aggression. He characterizes ascendance and submission as forms of adjustment which each individual adopts in varying degrees in virtue of biological necessity and cultural pressure whereby he dominates his fellows or passively yields to them in face-to-face contact.

Witkin identifies the characteristics of ascendance and

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<sup>15</sup>Gordon W. Allport, Personality, a Psychological Interpretation (New York, 1957), pp. 298-337.

submission much as Allport does, with one striking exception which will be noted in interpreting the negative relation between embedded figures test scores and the scores on the Allport A-S Study. Witkin<sup>16</sup> finds three personality characteristics particularly related to performance on his perceptual tasks. They are: the nature of the individual's relation to his environment (including other people), the way in which he manages his impulses and strivings, and the kind of conception he has of himself. The first of these characteristics seems to be the one which could to all appearances be assessed by the Allport test. Witkin found that the first-named represents the extent of activity of an individual in dealing with his environment. He found that this characteristic is the one which most effectively discriminates among people with different modes of perception. He considers active coping or passive submission the personality dimension most relevant to his perceptual tasks. His words are used to describe the characteristic:

The attitudes and behavior involved represent two more or less opposite trends: one, passivity, is associated with field-dependent perceptual performance; the other, activity, is associated with independent or analytical perceptual performance. Passivity signifies inability to function independently of environmental support, an absence of initiating activity, and a readiness to submit to forces of authority. Activity, on the other hand, involves ability to function with relatively little support from the environment, a capacity for

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<sup>16</sup>Witkin et al., Personality Through Perception, p. 467.

initiating and organizing, and the power to struggle for mastery over social and other environmental forces.<sup>17</sup>

Witkin stresses throughout his work the concept of activity as identifying the person who dominates his environment. In no place does he identify dominance with aggression. Besides the activity factor he states that active coping involves the capacity to initiate and organize responses to the environment and that passive submission involves not only a lower level of activity but also the inability to resist being carried along by environmental forces. However, he does bring in the concept of aggression. He believes that the way a person handles his aggressive impulses may be related to his capacity for active coping. He notes that in the development of a masochistic pattern, the individual confuses aggression with activity and denies himself both, bringing about a lowered activity level. He turns aggression against himself, abdicates self-assertion, assumes passivity and dependency.<sup>18</sup> Note that the point made here is that there is not an identification of aggressiveness and dominance or ascendance but rather, that as a result of confusing aggressive impulses with ascendance, a passive attitude is adopted.

Allport apparently makes aggression the underlying basis for

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<sup>17</sup>Ibid.

<sup>18</sup>Witkin et al., Personality Through Perception, p. 475.

traits of ascendance or submission; for, in explaining ascendance and submission as basic modes of adjustment he says that every individual must seek "his own most suitable level of aggression . . . everyone must be either a boot or a door-mat."<sup>19</sup> With this in mind, and remembering that Allport's choice of items for his study was on what he almost apologetically notes a priori grounds,<sup>20</sup> one suspects that in many instances the items on the A-S study are assessing traits of aggression rather than ascendance.

Allport provides us with the further information that in the standardization of his study, a positive correlation with submissiveness was shown on the part of the highest ten per cent in scholarship.<sup>21</sup> Elsewhere he comments that it is not easy to tell which is the cause and which is the effect.<sup>22</sup>

One further note is taken here before presenting an interpretation of the unpredictable results of this study. Positive correlations with intelligence were found in this investigation, one correlation as high as  $+.79$ .

The following, then, might be a possible interpretation of

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<sup>19</sup>Allport, Personality, a Psychological Interpretation, p. 298.

<sup>20</sup>Gordon W. Allport, "A Test for Ascendance-Submission," Journal of Abnormal and Social Psychology, XXIII (1928), 123.

<sup>21</sup>Ibid.

<sup>22</sup>Allport, Personality, a Psychological Interpretation, p. 413.

results. If Allport reports a persistent correlation between high grades in school and submission and the present study shows a positive correlation between intelligence and ability to separate an item from the field as represented by the low time scores on the embedded figures test, then it might be predicted that those of high intelligence as related to high grades would have 'better' time scores on the embedded figures test and would have 'low' or minus scores on the Allport test representative of submission. This was not the rationale underlying the ranking done in this study. Instead, since Witkin had found that the perceiver who characteristically is able to separate the item from the field and remain independent of the field in perceptual tasks is the one who actively copes with the environment with a capacity for initiating and organizing responses in the environment, then, a rank of 15, recognized as the 'best' score, would be given to a low time score and rank 15 would be given the score showing greatest ascendance. This resulted in negative correlations exclusive of the eighth grade girls' group.

Furthermore, since intelligence is a related factor in both the embedded figures test and the Allport study, one could predict that the highest negative correlation would be obtained by the group with the highest mean intelligence. This is borne out. Table 9<sup>23</sup> shows that the senior boys have a mean I.Q. of 118.3

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<sup>23</sup>Table 9, p. 50.

and Table 10<sup>24</sup> shows a correlation of  $-.22$  with the Allport A-S Study and the embedded figures test. The senior girls show a mean I.Q. of  $113.3$  and a correlation of  $-.04$ . Eighth grade boys have a mean I.Q. of  $110.5$  with a correlation of  $-.02$ . The eighth grade girls show a mean I.Q. of  $105.3$  and a correlation of  $+.31$ . The positive correlation seems to be a deviation from the former negative correlations. However, one recognizes that this correlation follows the trend showing an advancing correlation dictated by mean I.Q.'s of groups and that in a group with a mean I.Q. of  $105.3$ , high I.Q. is no longer a significant factor; and, hence, a correlation in the previously expected positive direction might be obtained. Further inspection of Tables 9 and 10 shows that the greatest difference in mean I.Q. points occurs between senior boys-senior girls and eighth grade boys-eighth grade girls and that predictably, because of relation of I.Q., the greatest difference in correlation values occurs between these two groups in each case. Although correlation values are not significant, they represent a trend in the theoretically expected direction.

These findings suggest that the construction of the Allport A-S Scale be studied more critically with a view to eliminating those items which reflect aggressiveness and not ascendance. If such a scale were devised, it is suggested further that the

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<sup>24</sup>Table 10, p. 53.

"persistent" correlation between high grades in school and submissiveness would disappear. It occurs to the investigator that such a result is a function of the test and not a true relation.

Anastasi<sup>25</sup> represents the A-S Study as " . . . having enjoyed wide popularity in its own right," and further " . . . has influenced the development of many other inventories." The authors of the A-S Reaction Study express the hope " . . . that the present study may be used primarily as a basis of future research in the measurement of personality and in studies concerning the nature of dominance. . . ." <sup>26</sup> They state further that " . . . in personality research in which it is desired to determine the ascendance of individuals for purposes of correlation, this study has often taken the place of rating scales, affording a more convenient and probably a more accurate measurement of the trait concerned." <sup>27</sup> Witkin has identified the characteristics of active coping or passive submission as the most discriminatory personality trait to predict modes of perceiving or, vice versa, that the characteristic mode of perception, that of being able to separate an item from the field, can indicate the characteristic manner of coping with environment. In view of these

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<sup>25</sup>Anastasi, p. 532.

<sup>26</sup>Gordon W. Allport and Floyd H. Allport, The A-S Reaction Study: Revised Manual (Boston, 1939), p. 14.

<sup>27</sup>Ibid., 16.



statements, it would seem to be worthwhile to give serious consideration to the task of devising a scale such as suggested here in the interests of personality research.

Table 4<sup>28</sup> shows results of the rank difference correlation between embedded figures test scores and the scores on the Gordon Personal Profile. Senior boys show a correlation of  $+.35$ , senior girls a correlation of  $-.07$ , eighth grade boys a correlation of  $-.12$  and eighth grade girls a correlation of  $+.15$ .

The Gordon Personal Profile to all appearances does not equate aggression and ascendance and would seem, for that reason, better suited to this study. This judgment is based to some extent on an example quoted in Anastasi<sup>29</sup> in which the case history shows aggressiveness with ascendance on the Gordon Personal Profile at the 6th percentile; and to some extent on the items in the Profile itself. Two positive correlations further bear this judgment out. However, there are other factors operating here, as witnessed by the two negative correlations, which are not evident. Perhaps an analysis of items on the Gordon Profile would reveal a situation similar to that of the Allport Scale. Anastasi<sup>30</sup> reports that though efforts were made to obtain orthogonal factors in the Gordon Profile, yet the four-factor scores

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<sup>28</sup>Table 4, p. 41.

<sup>29</sup>Anastasi, p. 547.

<sup>30</sup>Ibid., 546.

Table 11  
Means and Standard Deviations for Scores  
on Allport A-S Study  
(N= 15 for each group)

Group	Mean	S.D.
Senior Boys	+10.9	23.6
Senior Girls	+ 4.6	13.8
Eighth Grade Boys	- 4.4	18.1
Eighth Grade Girls	+ 8.9	22.1

Table 12  
Means and Standard Deviations for Scores  
on Gordon Personal Profile  
(N= 15 for each group)

Group	Mean	S.D.
Senior Boys	+4.4	6.8
Senior Girls	+5.2	4.3
Eighth Grade Boys	+1.7	6.2
Eighth Grade Girls	+2.7	3.6

are appreciably correlated. Particularly, significant correlations were found between Ascendancy and Sociability and between Responsibility and Emotional Stability. Combining the Ascendancy and Sociability scales or using items from the Sociability scales which are indicative of ascendance might produce positive correlations with the embedded figures test score.

## CHAPTER V

### Summary

The purpose of this investigation was to determine what relation exists between a perceptual task, the discovery of a simple figure in a complex figure, and the personality variable of ascendance-submission as assessed by two personality tests. A further relationship was sought between the age, sex, and intelligence of the perceiver.

The findings are summarized as follows:

1. There is an indication that the boys show a better ability than the girls in both age groups in perceiving a simple figure in a complex figure, though the difference in their ability to do so is not statistically significant.
2. Older children show greater perceptual ability in separating a simple figure from a complex figure, with the older boys' results on the task significantly better than the younger boys at the 1% level of confidence.
3. There is a positive relationship between the ability to perceive simple figures in complex figures and intelligence for the four groups. The eighth grade boys show a relationship significant at the 1% level of confidence.
4. The relationship between the ability to perceive simple figures in complex figures, a task which represents an ability to remain independent of the field, and personality test scores on ascendance yielded results in the predicted direction in only three of the eight correlations. A closer examination of the

Allport A-S Reaction Study and the evidence of a relation between intelligence and embedded figures test scores suggest that a possible explanation might lie in a more thorough study of these two areas.

The results found in this study seem to confirm other findings that the ability to perceive a simple figure in a complex figure varies with the age, the sex, and the intelligence of the perceiver. The negative correlations between the embedded figures test scores and the two personality questionnaires disagree with findings that there is a high positive correlation between ability on the embedded figures test and ascendance. This negative correlation may serve to point to a confusion of the terms ascendance and aggression as evidenced in the construction of the personality questionnaires.

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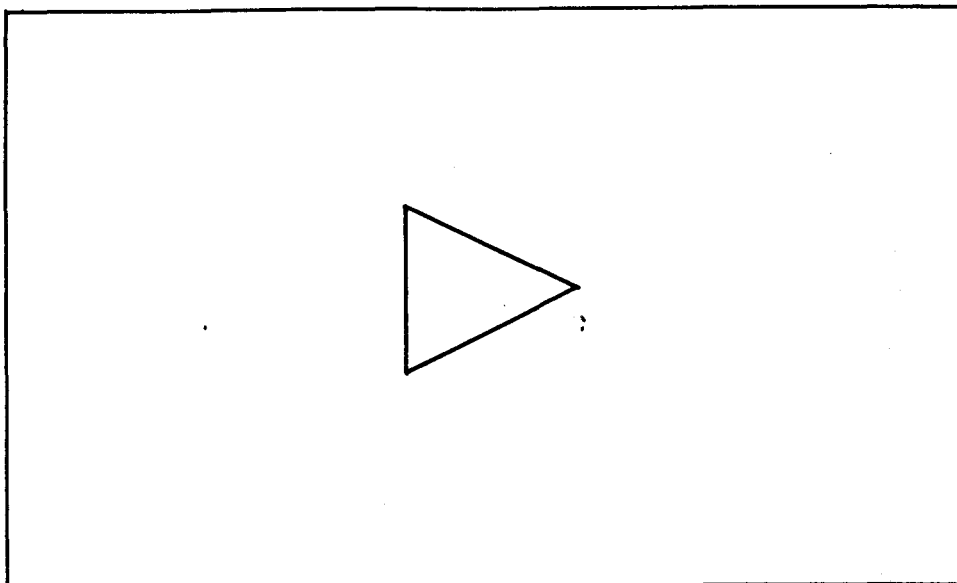


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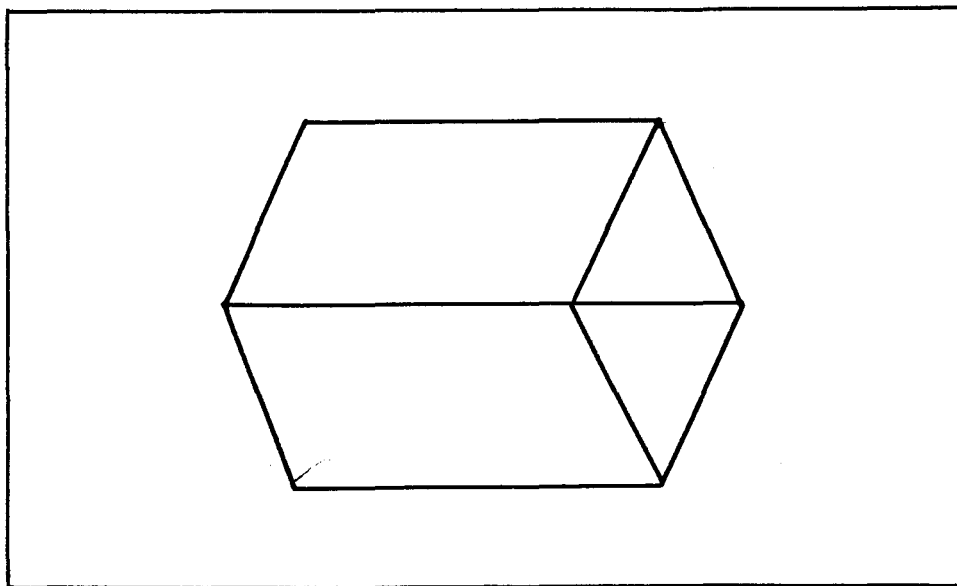
APPENDIX I

PRACTICE FIGURES

P



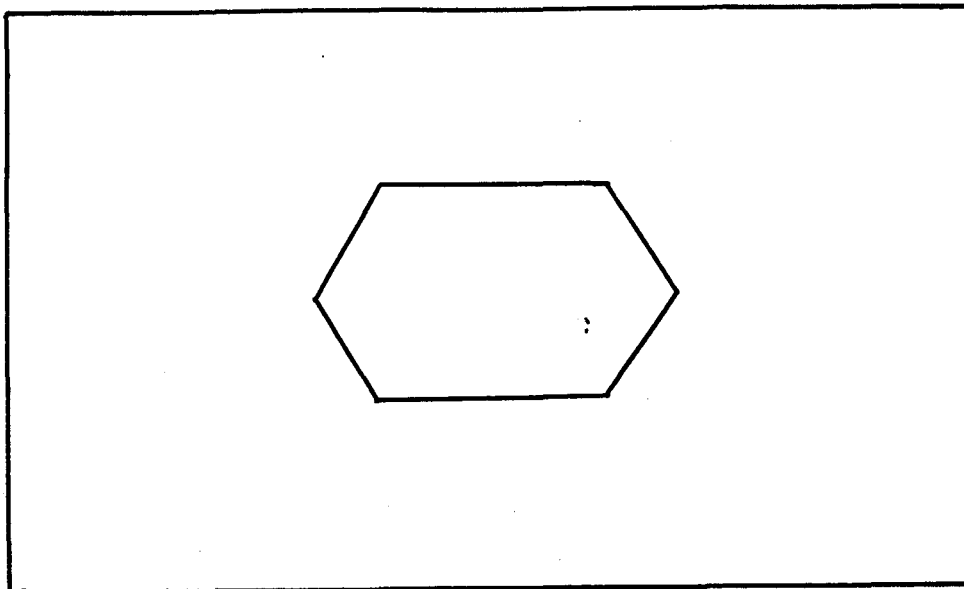
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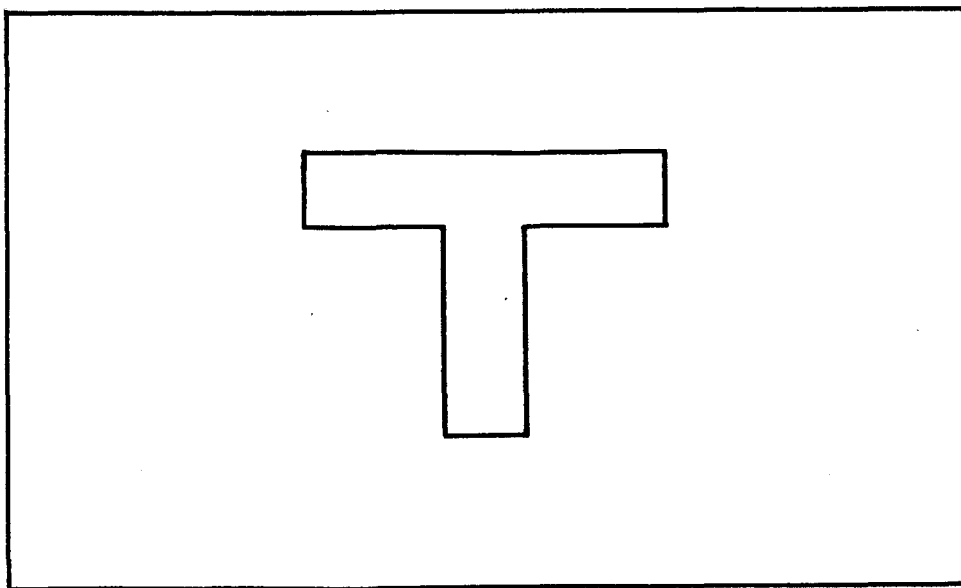
APPENDIX II

SIMPLE FIGURES

A



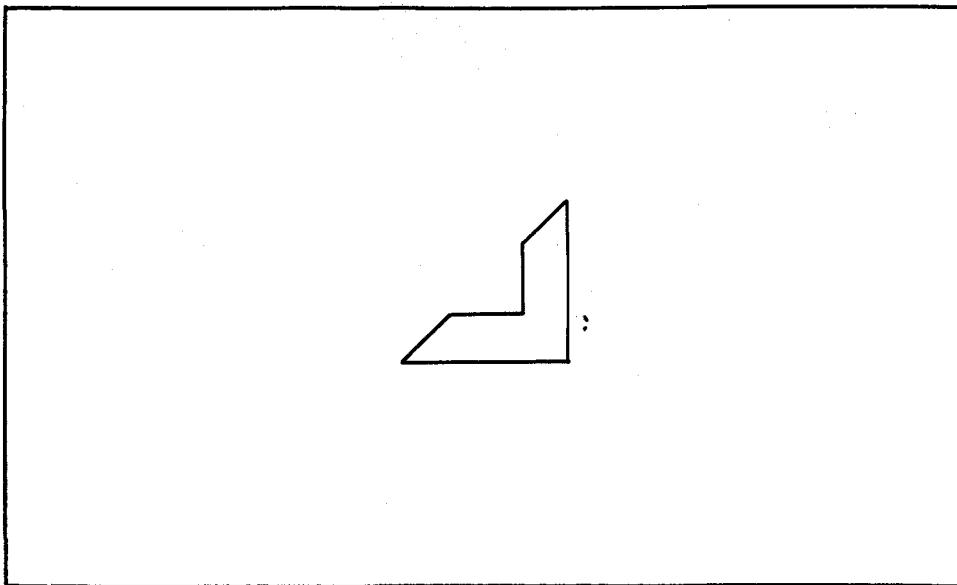
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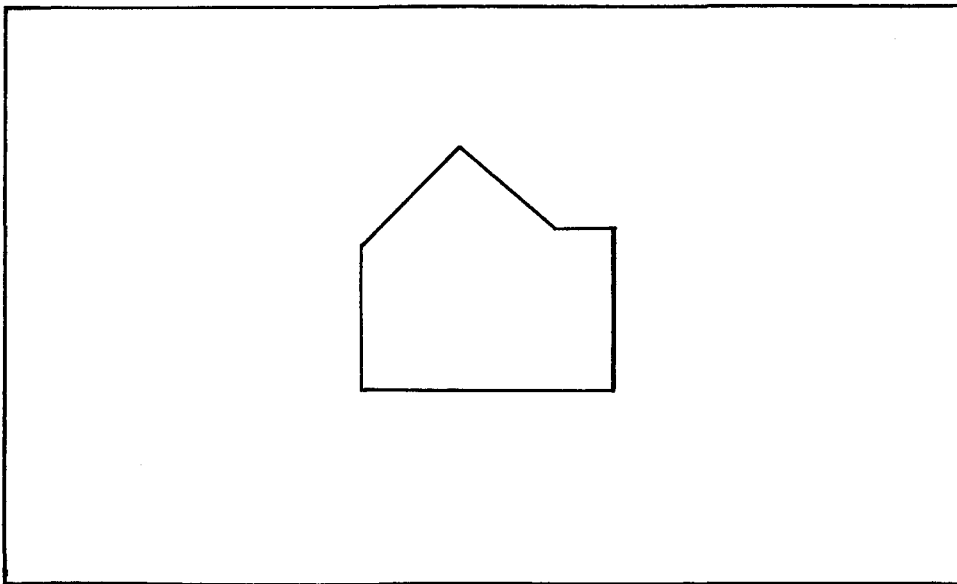
APPENDIX II (continued)

SIMPLE FIGURES

C



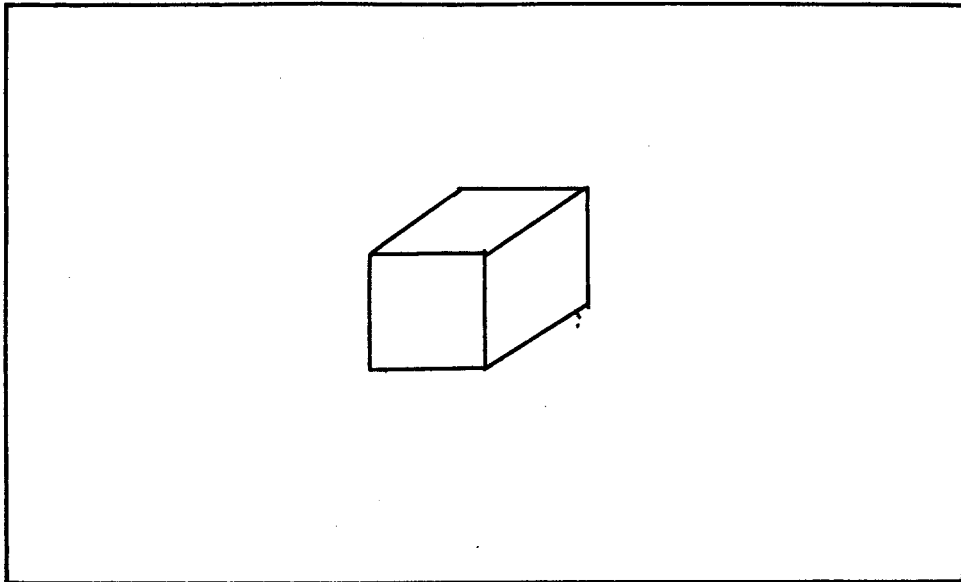
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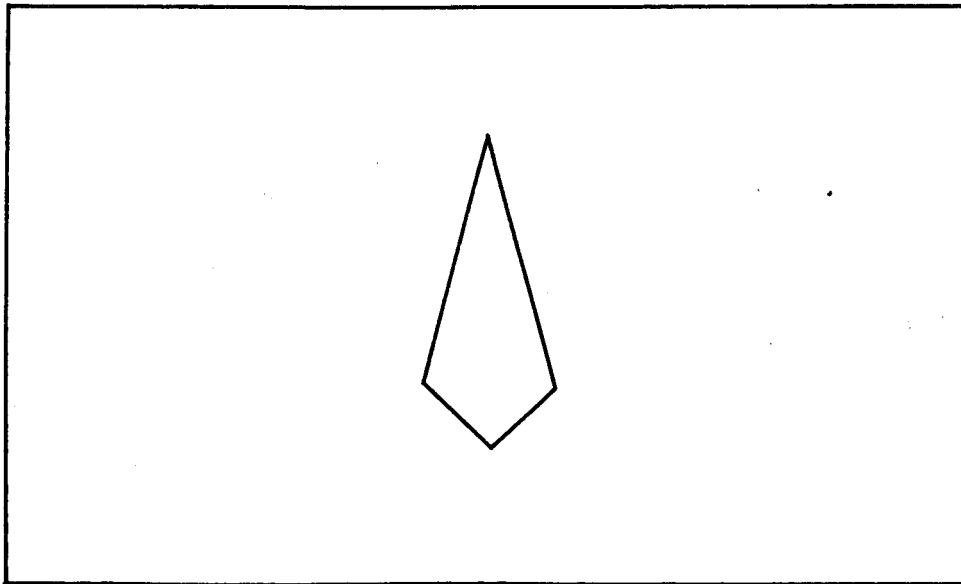
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SIMPLE FIGURES

E



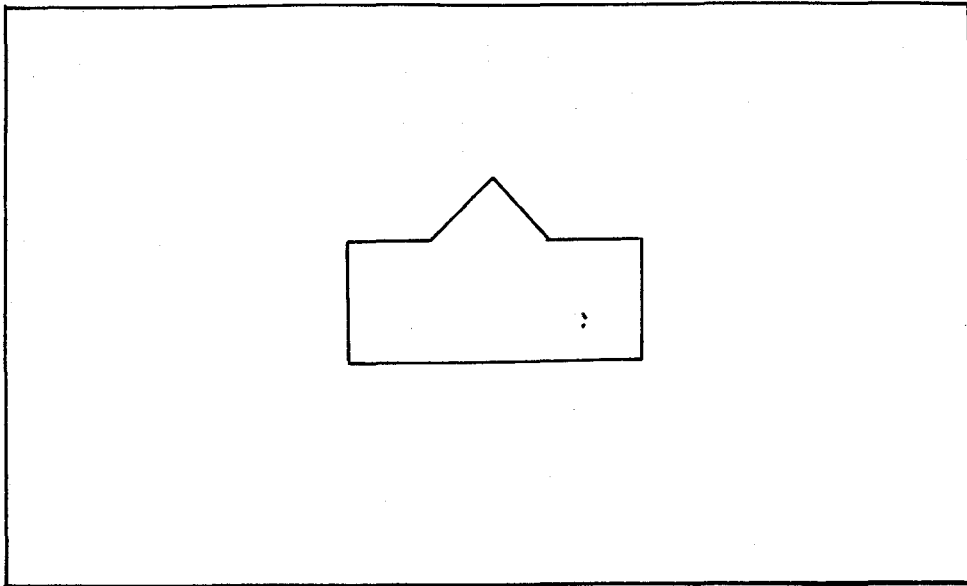
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APPENDIX II (continued)

SIMPLE FIGURES

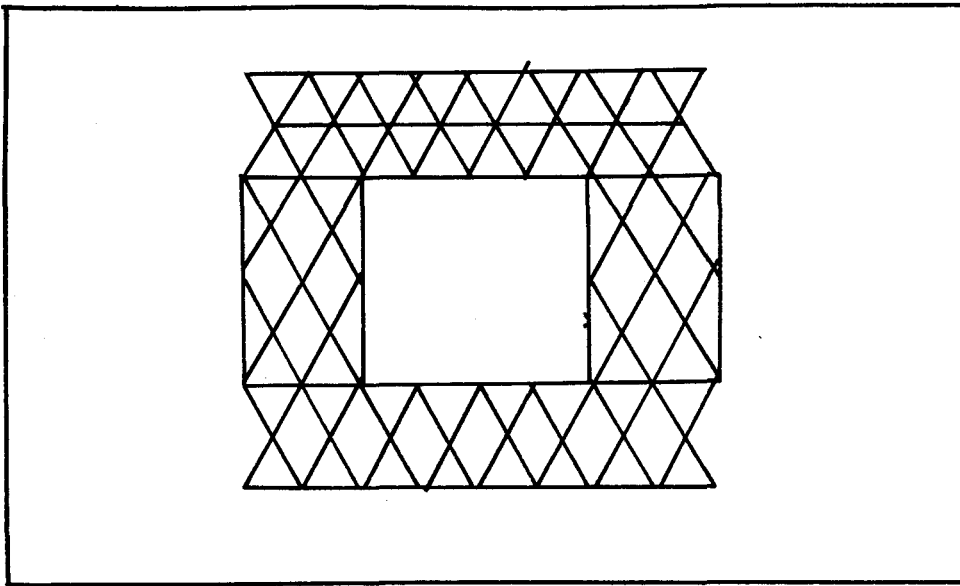
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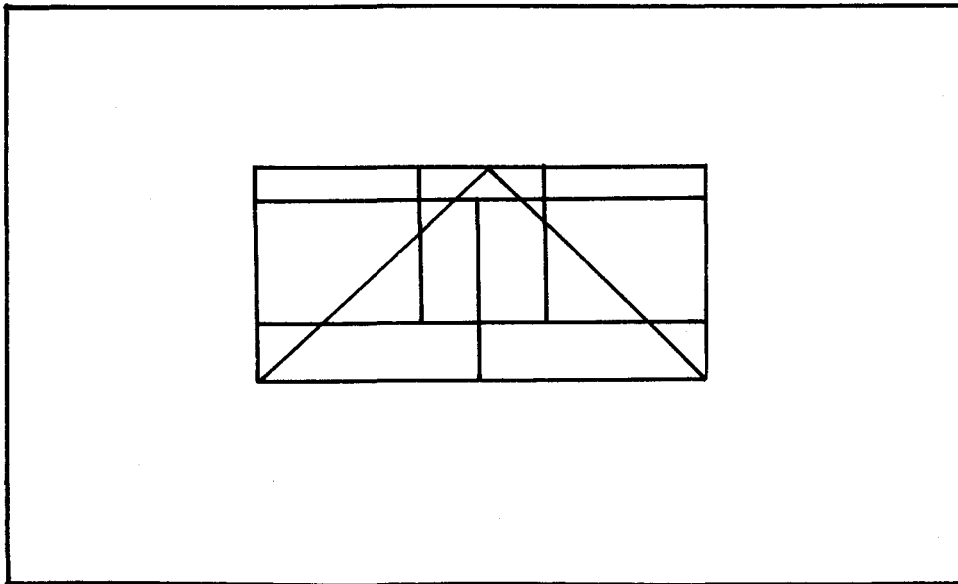
### APPENDIX III

#### COMPLEX FIGURES IN THE ORDER OF PRESENTATION

A-1



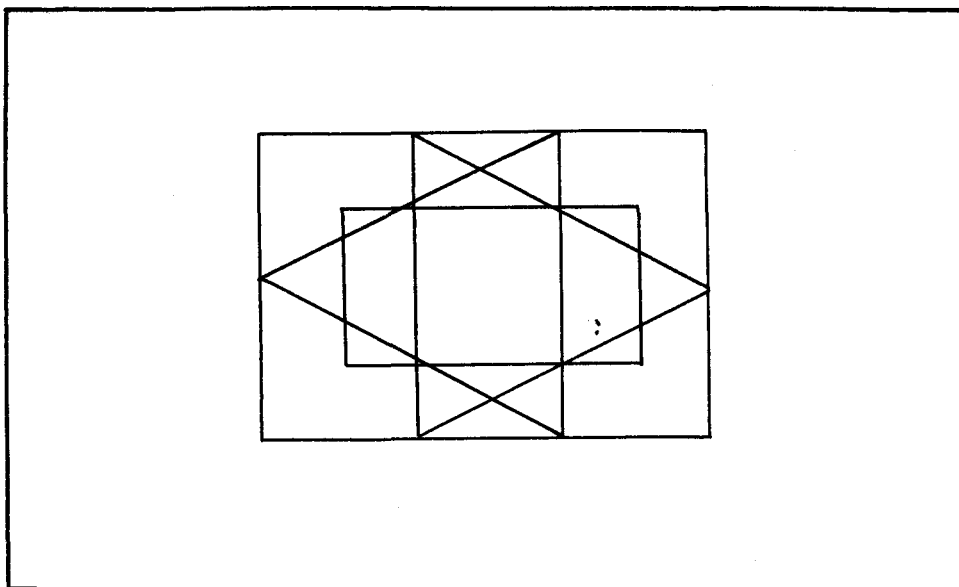
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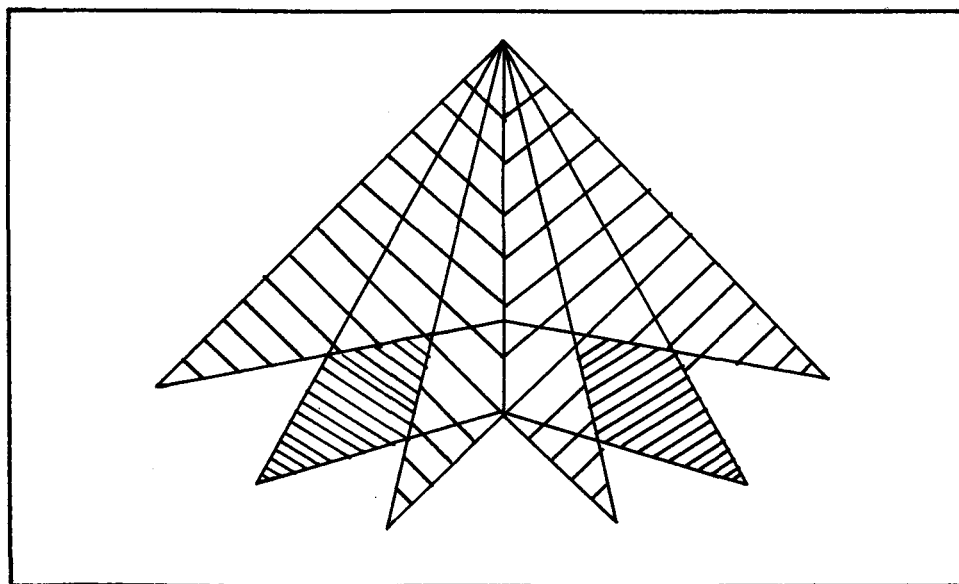
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COMPLEX FIGURES IN THE ORDER OF PRESENTATION

E-1



F-1

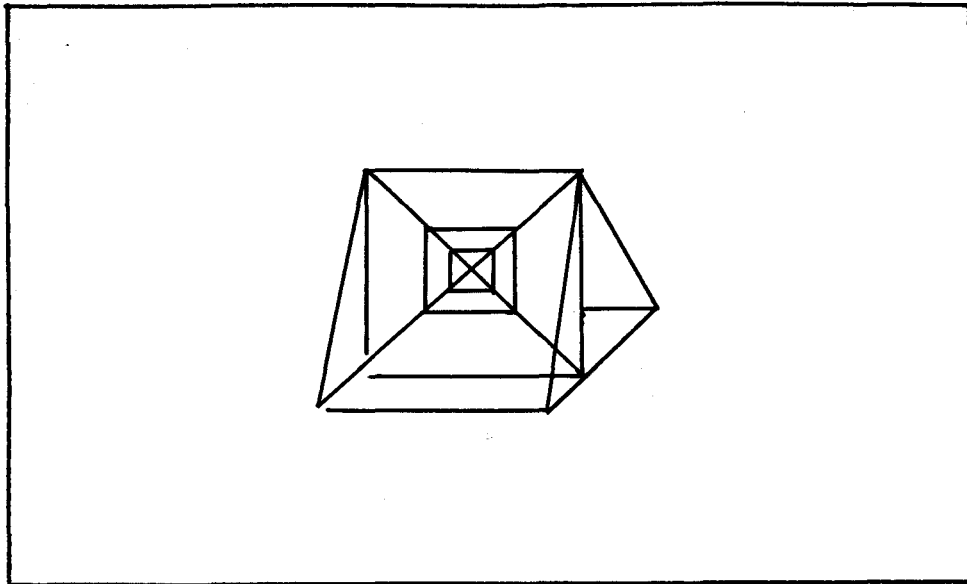




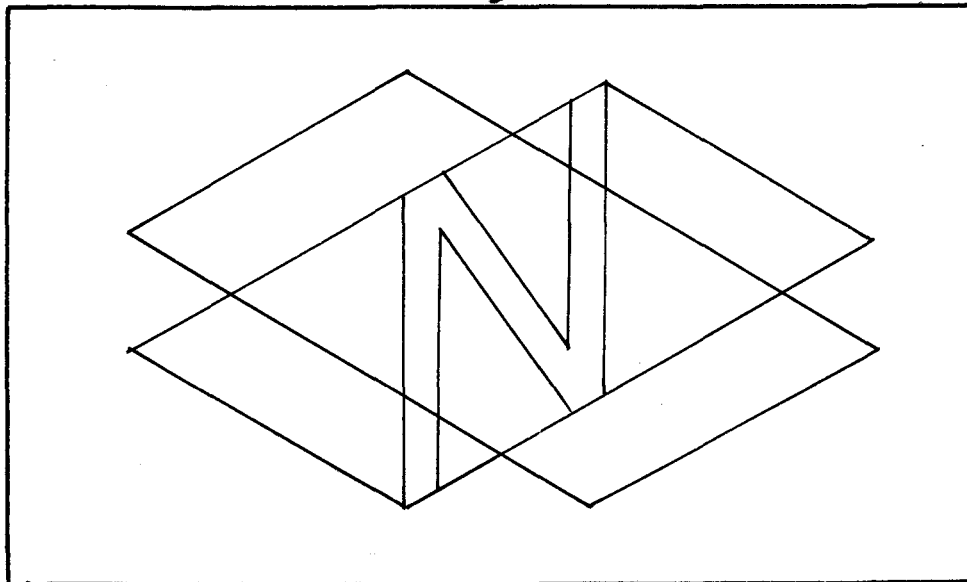
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COMPLEX FIGURES IN THE ORDER OF PRESENTATION

C-2



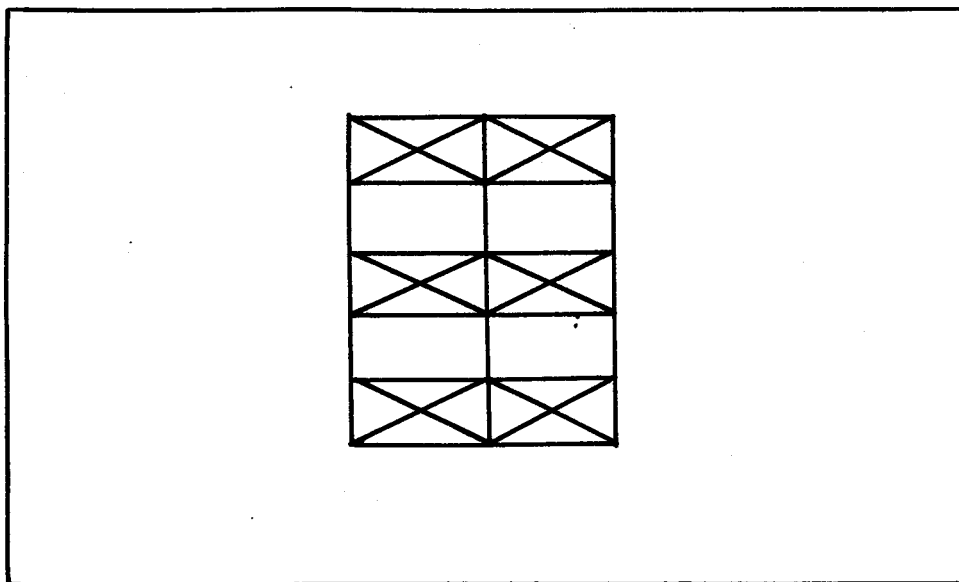
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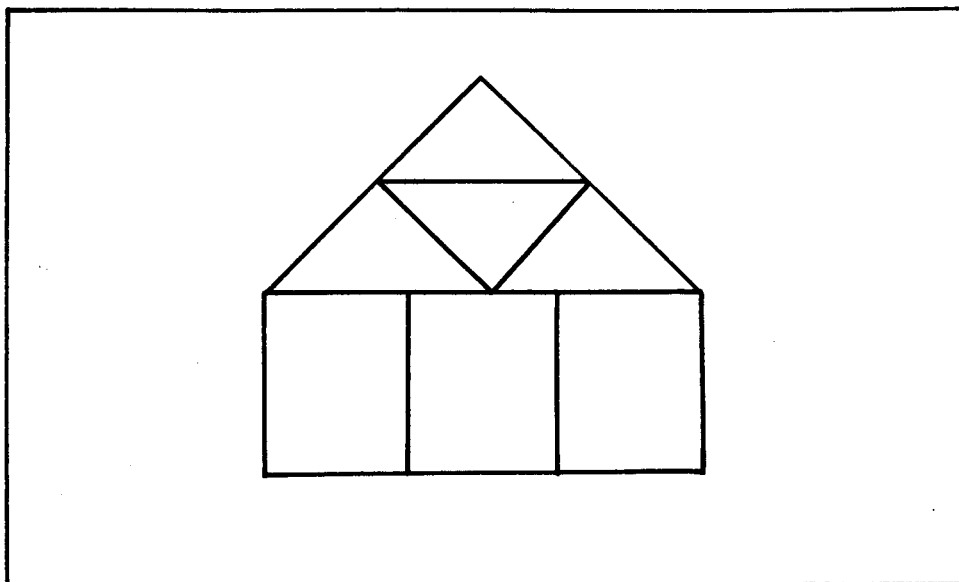
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COMPLEX FIGURES IN THE ORDER OF PRESENTATION

E-3



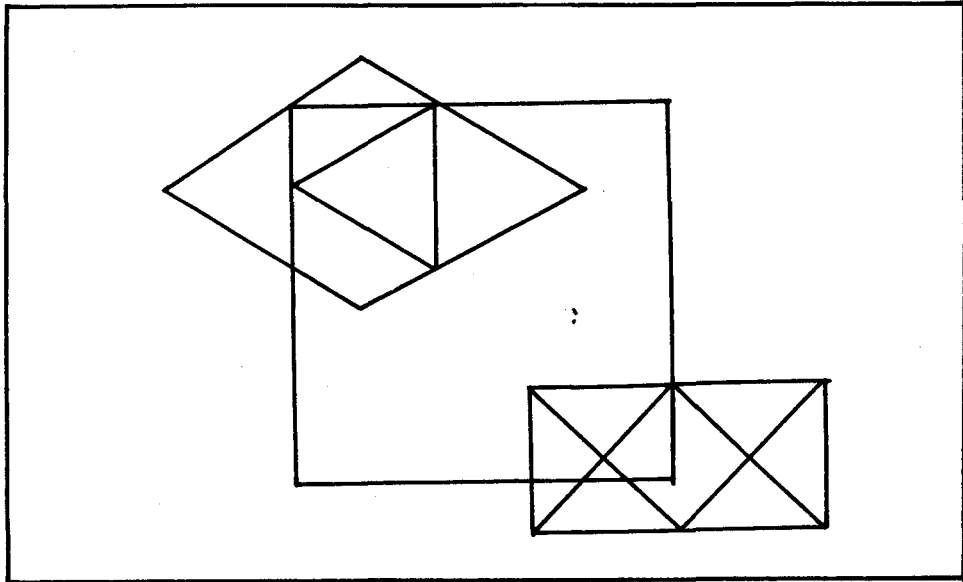
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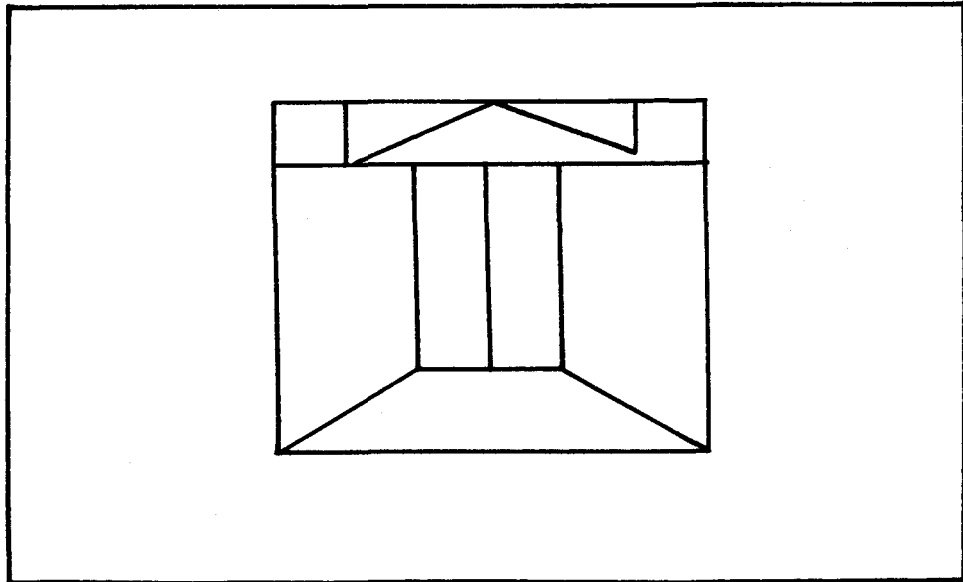
APPENDIX III (continued)

COMPLEX FIGURES IN THE ORDER OF PRESENTATION

A-4



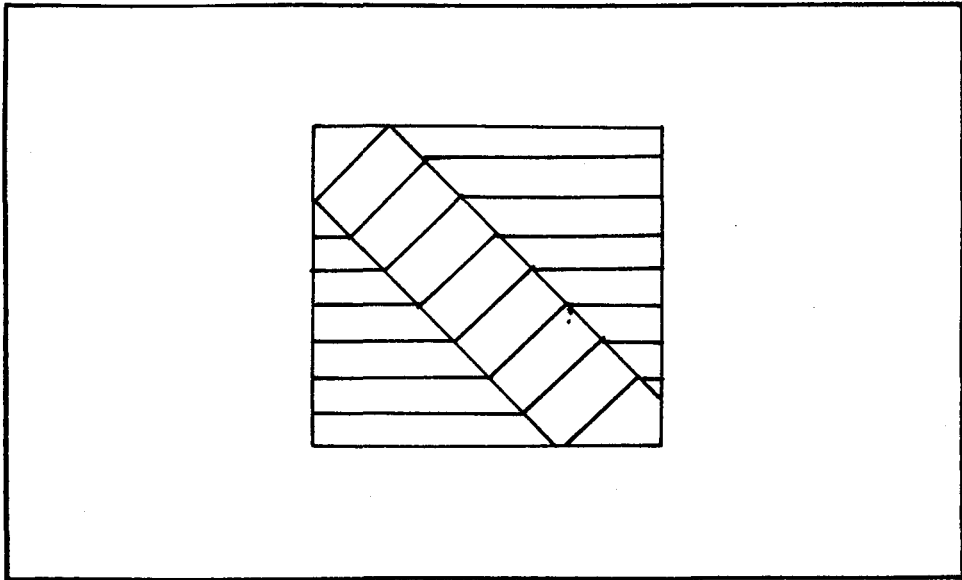
B-2



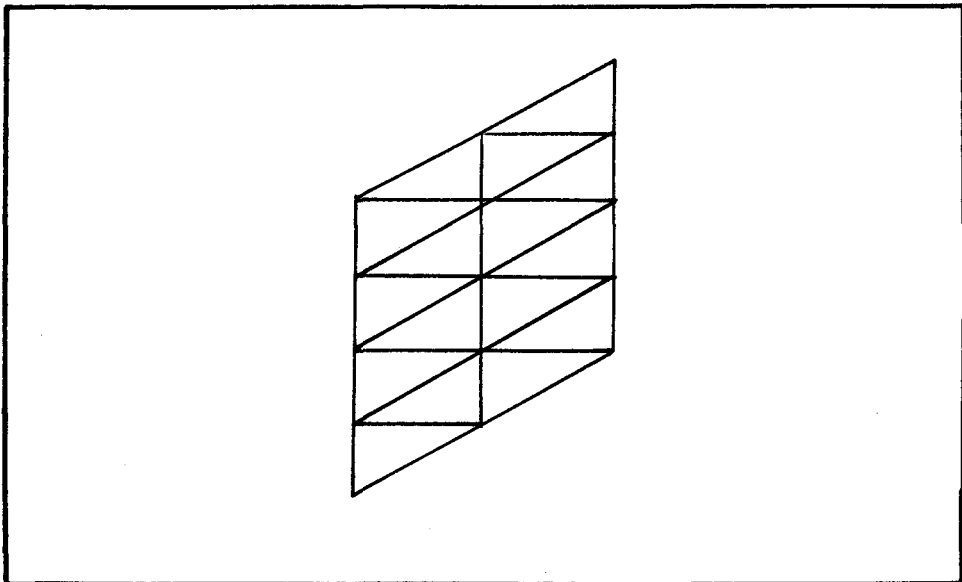
APPENDIX III (continued)

COMPLEX FIGURES IN THE ORDER OF PRESENTATION

G-3



E-5



NAME \_\_\_\_\_

SCORE \_\_\_\_\_

AGE \_\_\_\_\_

*Form for Men*

## A-S REACTION STUDY

**DIRECTIONS:** Most of these situations will represent to you your own actual experiences. Reply to the questions spontaneously and truthfully by checking the answer which most nearly represents your usual reaction. If a situation has not been experienced, endeavor to feel yourself into it and respond on the basis of what you believe your reaction would be. If the situation seems totally unreal or impossible to respond to, you may omit it.

1. In witnessing a game of football or baseball in a crowd, have you intentionally made remarks (witty, encouraging, disparaging, or otherwise) which were clearly audible to those around you?

frequently \_\_\_\_\_

occasionally \_\_\_\_\_

never \_\_\_\_\_

2. a) At a reception or tea do you seek to meet the important person present?

usually \_\_\_\_\_

occasionally \_\_\_\_\_

never \_\_\_\_\_

- b) Do you feel reluctant to meet him?

yes, usually \_\_\_\_\_

sometimes \_\_\_\_\_

no \_\_\_\_\_

3. At church, a lecture, or an entertainment, if you arrive after the program has commenced and find that there are people standing, but also that there are front seats available which might be secured without "piggishness" or discourtesy, but with considerable conspicuousness, do you take the seats?

habitually \_\_\_\_\_

occasionally \_\_\_\_\_

never \_\_\_\_\_

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4. A salesman takes manifest trouble to show you a quantity of merchandise; you are not entirely suited; do you find it difficult to say "No"?

yes, as a rule\_\_\_\_\_

sometimes\_\_\_\_\_

no\_\_\_\_\_

5. a) Have you solicited funds for a cause in which you are interested?

yes\_\_\_\_\_

no\_\_\_\_\_

- b) Do you feel reluctant to do such soliciting?

yes\_\_\_\_\_

no\_\_\_\_\_

6. a) A professor or lecturer asks any one in the audience, say of 20 or more people, to volunteer an idea to start discussion. You have what appears to be a good idea, do you speak out?

habitually\_\_\_\_\_

occasionally\_\_\_\_\_

rarely\_\_\_\_\_

never\_\_\_\_\_

- b) Do you feel self-conscious when you speak under such circumstances?

very\_\_\_\_\_

moderately\_\_\_\_\_

not at all\_\_\_\_\_

7. You have heard indirectly that an acquaintance has been spreading rumors about you which, though not likely to be serious in consequence, are nevertheless unjustified and distinctly uncomplimentary. The acquaintance is an equal of yours in every way. Do you usually

"have it out" with the person\_\_\_\_\_

let it pass without any feeling\_\_\_\_\_

take revenge indirectly\_\_\_\_\_

feel disturbed but let it pass\_\_\_\_\_

8. Some one tries to push ahead of you in line. You have been waiting for some time, and can't wait much longer. Suppose the intruder is the same sex as yourself, do you usually

remonstrate with the intruder\_\_\_\_\_

"look daggers" at the intruder or make  
clearly audible comments to your  
neighbor\_\_\_\_\_

decide not to wait, and go away\_\_\_\_\_

do nothing\_\_\_\_\_

9. Do you feel self-conscious in the presence of superiors in the academic or business world?

markedly\_\_\_\_\_

somewhat\_\_\_\_\_

not at all\_\_\_\_\_;

10. Some possession of yours is being worked upon at a repair shop. You call for it at the time appointed, but the repair man informs you that he has "only just begun work on it." Is your customary reaction

to upbraid him\_\_\_\_\_

to express dissatisfaction mildly\_\_\_\_\_

to smother your feelings entirely\_\_\_\_\_

11. After a very tiring day you decide to keep your seat in a crowded street-car even though ladies have to stand. You overhear one of the ladies refer to the situation in some remark to her companion. Do you

rise and offer your seat\_\_\_\_\_

remain in your seat feeling ill at ease\_\_\_\_\_

remain in your seat without embarrassment\_\_\_\_\_

12. You are at a mixed party where about half the people are friends of yours. The affair becomes very dull, and something should be done to enliven it. You have an idea. Do you usually

take the initiative in carrying it out\_\_\_\_\_

pass it on to another to put into execution\_\_\_\_\_

say nothing about it\_\_\_\_\_

# GORDON PERSONAL PROFILE

by Leonard V. Gordon

U. S. NAVAL PERSONNEL RESEARCH UNIT, SAN DIEGO, CALIFORNIA

Name \_\_\_\_\_ Age \_\_\_\_\_ Sex \_\_\_\_\_

Highest school grade reached: 8 9 10 11 12 F S J S Degree(s) \_\_\_\_\_  
HIGH SCHOOL COLLEGE

For students: School \_\_\_\_\_ Class \_\_\_\_\_

For adults: Occupation \_\_\_\_\_ Marital status \_\_\_\_\_

	A	R	E	S	T
99					
95					
90					
75					
50					
25					
10					
5					
1					
%-ILE SCALE					

## Directions

In this booklet are a number of descriptions of personal characteristics of people. These descriptions are grouped in sets of four. You are to examine each set and find the one description that is *most like you*. Then make a solid black mark between the pair of dotted lines beside the statement, in the column headed *M (most)*.

Next examine the other three statements in the set and find the one description that is *least like you*; then make a solid black mark between the pair of dotted lines beside that statement, in the column headed *L (least)*.

*Here is a sample set:*

	M	L
has an excellent appetite . . . . .		
gets sick very often . . . . .		■
follows a well-balanced diet . . . . .		
doesn't get enough exercise . . . . .	■	

Suppose that you have examined the four descriptive statements in the sample and have decided that, although several of the statements apply to you to some degree, "doesn't get enough exercise" is *more like you* than any of the others. You would place a mark beside that statement in the column headed *M (most)*, as shown in the sample above.

You would then examine the other three statements to decide which one is *least like you*. Suppose that "gets sick very often" is *less like you* than the others. You would place a mark beside the statement in the column headed *L (least)*, as shown in the sample above.

For every set you should have *one* and only one mark in the *M (most)* column, and *one* and only one mark in the *L (least)* column.

In some cases it may be difficult to decide which statements you should mark. Make the best decisions you can. Remember, this is not a test; there are no right or wrong answers. You should mark those statements which *most nearly apply to you*. Be sure to mark *one* statement as being *most like you*, and *one* statement as being *least like you*. Mark every set. Turn the booklet over and begin.

Mark your answers in column B →

	B		A	
	M	L	M	L
assured in relationships with others.....				
feelings are rather easily hurt.....				
follows well-developed work habits.....				
would rather keep to a small group of friends.....				
becomes irritated somewhat readily.....				
capable of handling any situation.....				
does not like to converse with strangers.....				
thorough in any work performed.....				
prefers not to argue with other people.....				
unable to keep to a fixed schedule.....				
a calm and unexcitable person.....				
inclined to be highly sociable.....				
free from worry or care.....				
lacks a sense of responsibility.....				
not interested in mixing with the opposite sex.....				
skillful in handling other people.....				
finds it easy to be friendly with others.....				
prefers to let others take the lead in group activity.....				
<del>seems to have a worrying nature</del> .....				
sticks to a job despite any difficulty.....				
able to sway other people's opinions.....				
lacks interest in joining group activities.....				
quite a nervous person.....				
very persistent in any task undertaken.....				
calm and easygoing in manner.....				
cannot stick to the task at hand.....				
enjoys having lots of people around.....				
not too confident of own abilities.....				
can be relied upon entirely.....				
doesn't care for the company of most people.....				
finds it rather difficult to relax.....				
takes an active part in group discussion.....				
doesn't give up easily on a problem.....				
inclined to be somewhat nervous in manner.....				
lacking in self-assurance.....				
prefers to pass the time in the company of others.....				

	A	R	E	S	T
+					
-					



APPROVAL SHEET

The thesis submitted by Sister John Amadeus Fronke, C.S.J. has been read and approved by a board of three members of the Department of Psychology.

The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated, and that the thesis is now given final approval with reference to content, form, and mechanical accuracy.

The thesis is therefore accepted in partial fulfillment of the requirements for the Degree of Master of Arts.

2/2/61  
Date

Vincent V. Heron  
Signature of Adviser