DIFFERENCES IN PERCEPTUAL ABILITIES IN GIFTED AND NON-GIFTED CHILDREN AS MEASURED BY THE MACGREGOR PERCEPTUAL INDEX

by

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ABSTRACT

Until about 1970, little was published on research pertaining to the influence of perceptual acuity in relation to gifted children. This study was undertaken to provide empirical data that might lead to a better understanding of such a relationship, to review research performed in the fields of both perception and giftedness, and to assess the usefulness of a non-verbal instrument for elementary teachers of art in diagnosing giftedness at a perceptual level.

The study was designed to determine, by means of a perceptual index test, whether or not gifted children who display above average intellectual skills, also exhibit above average perceptual skills. The MacGregor Perceptual Index (MPI) was administered to a group of twenty-four gifted and twenty-six non-gifted children between the ages of ten and twelve years. Categories included:- perception of distance, perception of embedded figures, perception of shape, perception of similarities and differences, perception of the vertical, perception modified by constancy, and perception of contour.

The investigation revealed similarities and differences among children of specific intellectual

capacity and ages in how they perceive and interpret visual stimuli. It was found that children with above average intellectual ability performed at a higher level on the Perceptual Index test than did subjects drawn from an average group.

The findings in this study led to recommendations for further investigation. The MPI, a non-verbal perceptual test, was judged to be a reliable instrument for diagnosing gifted children. In the synopsis of factors revealed in this study, it was concluded that there is a statistically significant relationship between perceptual ability and intellectual ability. The results of the study imply that training in perceptual problem-solving skills may generally enhance a child's intelligence level, and thus should be considered as part of the school curriculum.

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CHAPTER I

INTRODUCTION AND STATEMENT OF THE PROBLEM

Introduction

Daniel Keating, an American art educator, has observed that in respect to the subject" of 'gifted' children, the vast majority of highly academically able children and youth are poorly served by the present educational system." (1980, p. 56) Although this was written in 1980 the problem is a current one. Not only are the gifted and talented poorly served, they often exist unidentified.

Until the 1970s, giftedness was typically measured by verbal tests of intellectual ability. The work of McFee (1970), Guilford (1972), Torrance (1974) and others has contributed to the development of a broader definition of giftedness, acknowledging diverse talents and abilities.

In 1972, Sidney Marland, the former U.S. Commissioner of Education, proposed that gifted and talented children had high ability in the areas of general intellect, specific academic aptitude, creative or productive thinking, leadership ability, and visual and performing arts. He claimed that gifted and talented children

> are those identified by professionally qualified persons who, by virtue of outstanding abilities, are capable of high performance. These children require differentiated educational programs and services by the regular program in order to realize their contribution to self and society. (Marland, 1972, p. 10)

In his identification of gifted and talented children, Renzulli (1983) suggests that there are three clusters of traits: above average general ability, high level of task commitment, and high levels of creativity. His definition suggests that

> gifted and talented children are those possessing or capable of developing this composite set of traits and applying them to any potentially valuable area of human performance. Children who manifest or are capable of developing an interaction among these three clusters require a wide variety of educational opportunities and services that are not ordinarily provided through regular instructional programs. (p. 261)

This definition, although highly performance-based, is sufficiently diverse to include the potentially gifted and does not restrict giftedness to only those children possessing high levels of intelligence, as traditionally defined.

However, diagnostic procedures involving gifted children tend to account more for verbal ability than perceptual ability. And since perception, a non-verbal ability, is a component of human learning, it would seem appropriate to measure this capacity in the identification of gifted children. Kirk (1972) acknowledges a link between perception and the gifted child when he defines exceptional children as being those "who deviate from the average in sensory abilities." (p. 4)

Perception according to Held and Richards (1972) "is the process of knowing objects and events in the world by means of the senses." (p. 166) This study concentrates on <u>visual</u> perception.

Hagan and Bresnahan (1984) refer to visual perception as, "the acquisition of knowlege about the size, shape, slant, composition, distance, location, and sequencing of events and their object components through the pickup of information on the structured light to the eye." (p. 32) The purpose of this study is to determine, by means of a perceptual test, whether or not gifted children who display above average intellectual ability also exhibit above average perceptual ability.

Background to the Study

In the Australian Capital Territory interest in education for the gifted child has increased and programs in schools have been developed. In order to place children in these programs, measures of intellectual ability have been used to diagnose certain children as being gifted. Data used to identify giftedness in children for placement in these special programs range from standardized tests such as the Tola 6, and Weschler Intelligence Scale (described in Chapter II) to informal teacher/peer/parent nominations and previous scholastic reports.

In general the above criteria for giftedness focus upon verbal intellectual ability. Even parent/teacher observations tend to reflect concern for verbal skills and achievement. Yet, since perception is a component of human learning, it would seem important for tests to include this aspect for study and for teachers to direct attention to the inclusion of perceptual learning in programs for the gifted.

In considering the design of suitably challenging programs for schools, the MacGregor Perceptual Index (1971) was used to show how this valuable group of children termed "the gifted" might be assessed. In the development of education that takes account of both verbal and non-verbal learning, less attention has been given to perceptual learning by educators than that given to cognitive learning. McFee (1961) states, "We find it necessary to continue verbal education throughout the school years - but we have ignored the necessity for parallel visual education." (p. 185)

Programs for gifted children must also address the problem of including perceptual learning in order to achieve educational balance. Alexander (1981) argues that, "art educators need to devote attention to developing screening devices and tasks to help find gifted youngsters in the visual arts, especially since programs for the gifted may one day be mandated much as programs for the handicapped are now required" (p. 42).

Eisner (1972) emphasizes the importance of assisting children develop artistic readiness and perceptual learning:

> Learning to perceive what is subtle, learning to overcome visual constancies, learning to construct mental images of visual possibilities and learning to construct such images in another material are not simple tasks. It is the particular province of art education to assume responsibility for fostering these aspects of human ability. (p. 106)

As perceptual learning is part of everyone's experience, it is part of learning for gifted children. Despite that fact, in the art education literature it was not until the sixties through the writings of McFee that serious attention was paid to the area of perception in human learning. Since then, art educators such as Salome (1965), Eisner (1966), Arnheim (1969), MacGregor (1971), and McFee (1977) have increased our understanding and interest in this area.

In 1971 MacGregor developed his Perceptual Index (MPI). This index consists of seven major categories which include factors of perception of distance;

perception of shape; perception of embedded figures, perception of similarities and differences; perception of the vertical; perception modified by constancy; and perception of contour.

The instrument was designed on the assumption that perceptual processes influence picture perception. For example, a person's ability to discriminate figure from ground may be an influencing factor in their ability to perceive a complex painting. There is no evidence in art education literature that the MPI has been used with gifted children. One study used the MPI but this was with regular children. (McCord, 1973)

Systematic examination of the way gifted children use their perceptual abilities may facilitate the development of more effective programs for gifted children in the arts. MacGregor states "If he (the art educator [sic]) has knowledge of how children interpret visual information, he is then in a better position to devise art experiences appropriate to their interpretive capacities." (MacGregor, 1975, p. 54) In essence, the art educator may obtain insights for designing programs suited to the needs of children at their various stages of artistic development.

Statement of the Problem

The problem is to discover whether perceptual differences are present between gifted and non-gifted children, and whether these can be related to cognitive differences already diagnosed between the two groups. This may be stated as a question: Do gifted children display higher levels of perceptual ability than do non-gifted children? The study is therefore designed to explore the validity of the research hypothesis that a significant difference exists in MPI results between the scores of gifted children and those of non-gifted children.

Purpose of the Study

The purpose of the study is to extend knowledge of what constitutes perceptual ability in children identified as gifted. The ultimate intention for educational purposes is the design of curriculum suited to their specific needs.

Importance of the Study

There is a need for valid and reliable visual perception tests for use by teachers and administrators alike in the diagnosis of gifted children. MacGregor (1975) has pointed out that through an increased understanding of how children perceive visual stimuli, we as teachers may be able to lead children "toward a more adequate understanding of their visual world." (p. 61)

As teachers, our aim is to ensure that we do what we can to enable children to function at their highest level of ability. Since we acknowledge a close relationship between perception and understanding, we might predict that gifted children with generally heightened sensory awareness might demonstrate that awareness in the form of higher scores on the MPI. Furthermore, in order to determine how knowledge is gained about the environment and processed by the brain, we must first investigate how our senses provide us with this knowledge. As Gibson (1966) says, the senses may be considered as perceptual systems.

Theoretical Framework

Assumptions:

All children have perceptual ability to varying degrees.

The development of a child's perceptual ability is a desirable educational goal.

Hypotheses:

The validity of the research hypothesis can be confirmed or denied by recasting it in the null form and in this case subjecting it to the Mann-Whitney U test of statistical significance. The research question may first be stated in the form of a hypothesis. There will be a positive statistically significant difference, at the .05 level of confidence, in the MPI results, between the scores of gifted children and the scores of non-gifted children.

For the purposes of statistical comparison, the research question is restated in the null form.

$H_{\emptyset}$ There will be no positive statistically significant difference, at the .05 level of confidence, in the MPI results, between the scores of gifted children and the scores of non-gifted children.

Definition of Terms

For the purposes of this study the following definitions are used.

Cognition: discovery or rediscovery or recognition: the state of knowing through discovery. (Guilford, 1972, p. 351)

Memory: means retention of what is cognized. (Guilford, 1972, p. 351)

Divergent thinking: mental operations leading thoughts in different directions, sometimes searching, sometimes seeking variety. (Guilford, 1972, p. 351)

Convergent thinking: mental operations leading to one right answer or to a recognized best or conventional answer. (Guilford, 1972, p. 351)

Evaluation: mental processes used in reaching decisions as to goodness, correctness, suitability or adequacy of what we know, what we remember, and what we produce in productive thinking. (Guilford, 1972, p. 351)

Figural content: concrete material such as is perceived through the senses. It does not represent anything except itself. (Guilford, 1972, p. 351)

Visual material: has properties such as size, form, colour, location and texture. Things we hear or feel provide other examples of figural material. (Guilford, 1972, p. 351)

Symbolic content: is composed of letters, digits and other conventional signs, usually organized in general systems e.g. alphabet or number system. (Guilford, 1972, p. 351)

Semantic content: is in the form of verbal expressions or ideas, for which no examples are necessary. (Guilford, 1972, p. 351)

Percept: an impression of an object obtained by use of the senses. (McFee, 1961, p. 48)

Concept: an idea about an object, generalized from previous experiences with the object. (McFee, 1961, p. 48)

Perceptual Constancy: the tendency to compromise between what is known and seen. (McFee, 1961, p. 48)

Conception: a process of using words to categorize and relate experiences, which may be direct sensory experiences or responses to the language of others. Both conception and perception are cognitive processes. (McFee, 1961, p. 48)

Perception: the process of knowing objects and events in the world by means of the senses. (Held & Richards, 1972, p. 166)

Sensations: physiological reactions when each individual receptor is stimulated. (Hochberg, 1964, p. 55)

Memory images: are the recollections of previous sensations. (Hochberg, 1964, p. 12)

Primary school: Within the Australian school system, these grades are similar to those of elementary schools within Canada. They exist for children typically 5 - 12 years of age and consist of grades 1 through to 6, though not 7 as is the case in some parts of Canada.

Research Procedures

Population Defined

The total population sampled is composed of all children from the gifted program at B Primary School in the ACT and a corresponding number within the same age group of children who responded to approval forms sent home by the principal from the A Primary School.

Sample

The sample consisted of 24 prediagnosed gifted children (i.e. the total population of identified gifted children within the ACT): 14 girls and 10 boys from the B Primary School. These children, all age 10 or 11, corresponded to a similar random sample from A Primary School.

Instrument Used

The MacGregor Perceptual Index was the measuring tool. The index consists of a booklet which consists of 48 black and white photographs viewed by each child; answer sheets to be completed by each child; and a scoring key. The subject is required to select one of several possible answers provided for each question, and indicate a preferred response with a check mark.

Administrative Procedure

The procedure was identical for both the gifted and the non-gifted groups. The test was administered to groups of six by the researcher within the respective schools over a week period. Each child was given a pencil, answer sheet and test booklet. The time taken for each session was not in excess of forty minutes.

Delimitations of the Study

The study was designed to investigate the responses of gifted compared to non-gifted children in their response to the perception of distance; perception of embedded figures; perception of shape; perception of similarities and differences; perception of the vertical; perception modified by constancy; and perception of contour. The study focused on a restricted number of specific perceptual qualities being measured and the test was of a non-verbal nature.

Neither sample of children was diagnosed by the researcher. It is assumed that the random sample of non-gifted children did not contain undiagnosed gifted subjects.

The Australian Capital Territory has an unusually homogenous population. Information from the ACT Schools Authority was obtained to rank the socio-economic levels of both schools as a further check to minimize the possible compounding effects of socio-economic differences.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

This chapter deals with an introduction to giftedness and perception, followed by a discussion of education programs for the gifted. Next, selected aspects of perception as these relate to the instrument used in this study are dealt with, and a final section examines tests and measures in a more general context.

Giftedness and Perception

Definitions of giftedness have changed over time according to educational emphasis. Giftedness can vary in meaning but is generally defined as an attribute of a person highly capable in a variety of abilities that are artistic, intellectual, creative, musical or verbal.

Early in this century, William Stern (1914) was one of the first to offer a definition of intelligence that differentiated general intelligence from special intellectual talents and abilities. He defined intelligence as, "a general capacity of an individual consciously to adjust his thinking to new requirements. It is general mental adaptability to new problems and conditions of life". (p. 3)

Stern's work greatly influenced that of the psychologist, Lewis Terman, who developed the Stanford-Binet Intelligence Scale. The Stanford-Binet Intelligence Test determined the intelligence quotient as a measure for identifying special children within school populations. This provided an instrument which was widely used for diagnosing the intellectually gifted child. The formula offered a ratio of mental age to chronological age in terms of a score.

$$\frac{\text{Mental age}}{\text{Chronological age}} \times 100 = \text{Intellectual quotient}$$

According to Terman, Binet's choice of tests to determine the nature of intelligence was diverse. The Stanford-Binet Intelligence scale is based upon

> tests of time orientation, of three or four kinds of memory, of apperception, of language comprehension, of knowledge about common objects, of free association, of number mastery, of constructive imagination, and of ability to compare concepts, to see contradictions, to combine fragments into a unitary whole, to comprehend abstract terms, and to meet novel situations. (p. 345)

However, although this scale is comprehensive in its measure of intellectual/verbal ability, (and is frequently used as a basis for this purpose), it tends to overlook non-verbal and creative abilities.

The first intelligence scale was revised by Terman in 1916, based on the work of Binet and Simon in 1911. Since then the Revised Stanford-Binet Forms L & M (1937) and Form LM (1960) have been further refined by Terman and Merrill, and bear little resemblance to the original 1916 scale.

Getzels and Jackson (1962) wrote - "In most studies, the word 'gifted' was synonymous with 'high IQ' and the term 'gifted child' was for all intents and purposes only a shorthand way of saying 'child with a high IQ'. Consequently, a child without a high IQ regardless of other achievements, was not considered 'gifted'". (p. 23) Although IQ scores were an indication of intelligence, they measured verbal and cognitive intelligence, and failed to include special abilities in other areas such as art, music, performing arts and mechanics.

Busse and Mansfield (1980) suggest that, "the efficiency, quantitativeness, and apparent absoluteness of the IQ have fostered its widespread acceptance as the sole criterion controlling entrance to gifted programs". (p.132) Hermelin and O'Connor (1980) point out that:

> Work on the psychological processes which might be specific to highly gifted children has tended to be dominated by the concept of the IQ. This predominance has only been marginally affected by research on creativity which attempts to distinguish an analytic or convergent form of intelligence from a divergent or associational form. (p. 180)

This statement is reflected in the work of J.P. Guilford (1959) who identified 120 multidimensional factors of intelligence, and later further identified differences between convergent and divergent thinking.

The convergent thinker provides a conventional response to data presented, while the divergent thinker handles data in a manner which fosters a variety of responses. According to Guilford, high performance in divergent thinking tests requires originality, fluency and flexibility. Guilford introduces evidence that high scorers on IQ tests tend to be convergent thinkers.

Guilford developed a three dimensional model he termed <u>the structure of the intellect</u> which suggests an interaction between content, operations and product; that is, the information we think about, the ways in which we think and the outcome of our thoughts.

In his construct Guilford offers five basic operations or processes of intellectual functioning: cognition, memory, divergent production, convergent production and evaluation. Guilford suggests that cognition means discovery, recognition, understanding or awareness in the intellectual sense; memory means retention of what is cognized; divergent productive thinking generates new information from known and remembered information i.e. thinking in different directions. This is closely related to creative thinking as defined by MacKinnon (1963) where emphasis is placed on variety and quantity of responses. Convergent thinking suggests that information leads to one "right" or conventional answer. Evaluation is a judgement process which involves reaching decisions as to goodness, correctness, suitability, adequacy of what we remember, and what we produce in productive thinking.

Children adept in evaluative processes may not necessarily produce evaluative statements. An underachieving child may be able to evaluate yet have difficulty in demonstrating this verbally. Consequently, his/her performance does not correspond to his/her actual ability.

MacKinnon states that,

> the creative person is typical of many who make up for what they lack in verbal intellectual giftedness with a high level of energy, a kind of cognitive flexibility which enables them to keep attacking a problem with a variety of angles, and being confident of their ultimate success, they persevere until they arrive at a creative solution. This kind of person should remind us that giftedness is not necessarily equated with high verbal intelligence. (p. 3)

Passow (1981) in his identification of the gifted and talented says that giftedness,

> is related not only to systematic observation and intelligent interpretation of test and observation

> data, but to the creation of the right kinds of educational opportunities which facilitate self-identification — identification by performance and product which results in the manifestation of gifted and talented behaviours. (p. 9)

Passow acknowledges however, that "not all individuals who are identified as being 'gifted' possess all of the cognitive, affective, physical or intuitive characteristics which are ascribed to gifted and talented individuals." (p. 9) Barron (1973) also assisted in revising concepts of the nature of giftedness to include creativity as either a component of talent and giftedness or a type of talent and giftedness to be identified and nurtured. Torrance (1977) added to the numerous characteristics of gifted and talented children. His techniques are based on observation of children's behaviour and an analysis of what they produce. He suggests that strengths in such areas as the ability to express emotions, feelings, articulateness, enjoyment, humour, fluency and flexibility in figural media, responsiveness, expressiveness to be some of the characteristics which identify exceptional creativity.

Renzulli, in his definition (Renzulli, 1983) of giftedness focuses on three clusters of traits. These are: above average general ability, high level of task commitment, and high levels of creativity. He recommends that identification procedures should give equal attention to all three clusters. In this operational definition, he contends that giftedness consists of an interaction among these three clusters and that "measures of cognitive ability only account for a limited proportion of the common variance with school grades." (p. 12) He goes on to divide giftedness into two types: 1) Schoolhouse giftedness, which he also refers to as test-taking or lesson-learning giftedness. This type is most easily measured by IQ tests or other cognitive ability tests; and 2) Creative/productive giftedness, which describes "aspects of human activity and involvement where a premium is placed on the development of original material and/or products that are purposefully designed to have an impact upon one or more target audiences." (p. 12) Renzulli emphasises the need for special programs to be developed to encourage both types individually and together.

Clark (1979), Kaplan (1975), and Martinson (1974) cite superior problem-solving ability as a characteristic of gifted children. Their findings revealed that there was no conclusive evidence to support the general hypothesis of superior problem-solving abilities in the gifted.

In a study conducted by Ludlow and Woodrum (1982), 20 gifted and 20 average children (age 11) were tested on pattern responses to problem tasks. They declared that "the most surprising result of the study revealed that both gifted and average subjects tended to use similar problem-solving strategies across tasks" (p. 102).

According to Mussen, Conger and Kagan (1974) it is apparent that children use improved problem-solving strategies with advancing age as a result of increased perceptual ability. Naeli and Harris (1976) indicate that this process begins in infancy.

Education for the Gifted

Levels of interest in education of the gifted and talented have varied historically. As far back as 1779 Thomas Jefferson advocated special learning provisions for capable students as part of his School Plan for Virginia. In 1890 public schools in New Jersey divided classes into groupings based on academic achievement, the high achieving group progressing more rapidly through the curriculum. This was referred to as the Three-Track Plan.

The first known separate school for the gifted was established in Worcester, Massachusetts in 1901, the main objective being the acceleration of academic progress. The years that followed saw an increase in the number of special schools. However, subjects were generally limited to maths, science and foreign languages. The White House Conference Report (1931) on Gifted Children stressed that giftedness meant merely the child with exceptional intelligence, and neglected the possibility that giftedness might be exhibited in the arts, music and other areas.

In the early 1950s post-war enthusiasm for the National Association's Educational Policies Commission on Education of the Gifted emphasized the need for personnel in the sciences, arts and professions.

But it was not until 1958 that the US Office of Education accepted a definition of giftedness that acknowledged its general character. This definition, published in the 57th Yearbook of the National Society for the Study of Education (1958), reads:

> A talented or gifted child is one who shows consistently remarkable performance in any worth-while line of endeavour. Thus, we shall include not only the intellectually gifted but also those who show promise in music, the graphic arts, creative writing, dramatics, mechanical skills, and social leadership. (p. 19)

Congress passed the National Defence Education Act (1958) authorising federal funds to provide loans and grants in an attempt to strengthen educational offerings in science, mathematics and foreign languages in the national interest. And the Rockefeller Brothers Fund of 1958 promoting the pursuit of excellence in America, stressed the optimum achievement of each citizen within society. California, Illinois and New York pioneered state reimbursement for special programs for gifted children.

In 1959 Irving Taylor identified five levels of creativity. These were expressive, technical, inventive, innovative and emergent. Taylor suggests that creative ability comes under the higher level of mental operation of divergent and evaluative thinking.

Gowan, Demos and Torrance (1967) support this notion by suggesting that "present indications favour divergent-productive and transformational abilities, as the ones most directly involved in creative potential." (p. 87)

Guilford (1959) identified one hundred and twenty-one factors of intellectual ability embodied in a three-dimensional theoretic model of intelligence called the Structure of Intellect. His ideas focus on two opposites, convergent and divergent production.

In the sixties, researchers focused more and more upon aspects of giftedness that involved non-verbal factors. Project Talent was inaugurated by the United States Office of Education in 1960, under the direction of John C. Flanagan. The study, involving 440,000 secondary students, was intended to measure individual talents and then relate them to adult life performance.

Getzels and Jackson (1962) in their research made distinctions between creativity and the traditional concept of general intelligence. They defined two types of creative individuals. One was identified with high IQ, and exhibited convergent behaviour, while the other, significant on creative measures, was designated divergent-oriented. Their studies revealed that students with average intellectual abilities may do as well or better than high IQ students on tasks requiring creative applications or strategies of information handling. It appeared to Gretzels and Jackson that there is no clear relationship between measured intelligence, creative thinking and problem-solving.

Sidney Marland (the Commissioner of Education) under the 1970 mandate of the U.S. Congress conducted a study evaluating the status of education for the nation's gifted and talented children. His findings, together with recommendations, generated national interest. He claimed that,

> There are higher relationships between general intelligence and the individual tests of creativity than among the individual measures themselves. Although a few studies have supported the creativity-intelligence distinction,

> most have established substantial relationships between creativity and intellectual aptitude. (p. 7)

In 1958 Lowenfeld and Brittain described factors that distinguish gifted from average children in the field of art. These included expression, use of media, subject matter, imagination and personal involvement.

Kenneth Beittel and his collaborator Robert C. Burkhart (1972) published an account of a lengthy research program into psychological factors in drawing and the drawing context and processes. They defined two alternate strategies - Divergent, a strategy for discovering; and Spontaneous, a strategy for problem solving. The research indicated that original thinking, or discovering a unique phenomenon, is only one aspect of creativity and that problem solving is another.

The distinction between intelligence and creativity was reinforced in research conducted by Torrance (1972). He indicated that there is little correlation between intelligence and creativity among children with an IQ of greater than 120.

The ERIC Clearinghouse for handicapped and gifted children was established and operated by the Council for

Exceptional Children in order to gather, evaluate and disseminate information on all aspects of talented and gifted education. In 1972 the U.S. Office of Education focused national attention on the needs of the gifted and talented, especially regarding leadership and the promotion of differentiated programs. The Council for Exceptional Children in the U.S. (1978) reported findings from a survey conducted in all States. Financial assistance was provided to agencies, institutions and organizations to improve programs to meet the needs of gifted and talented children.

Gallagher (1979) recommends a revolving door approach to the teaching of gifted children within the school system. This approach, supported by Renzulli (1979) allows a child to move to and from a class of advanced learning, and back to an average classroom depending on his/her individual ability.

Robin Alexander (1981) emphasized three areas of concern for art education for the gifted and talented. These were identification of the artistically talented/gifted student, curriculum design and program development for the gifted, and evaluation of programs for this group.

In response to Alexander's research report, Moody (1981) conducted a National Art-Tag Survey through 224 cities and large towns of North America. Using Alexander's first category, Moody identified which children should be nominated to a gifted/talented program, whether IQ and academic rank should influence selection, what kinds of tests or devices are acceptable (informal or formal means, observations, single or multiple criteria), personalized student abilities and/or data acceptable.

The outcome of the survey resulted in a book Visual Arts in Gifted Programs. The book describes 31 programs addressing the concerns of gifted education and that of art education.

The foregoing details in this chapter make it apparent that many definitions of the gifted and talented child have been proposed as a means of identification. Research relating to the gifted and talented has offered greater understanding of their general behaviour, characteristics and needs. Theories have been developed to explain these observations.

Terman in 1925 made a useful suggestion that presently serves to reinforce the rationale for this study: When the sources of our intellectual talent have been determined, it is conceivable that means may be found which would increase the supply. When the physical, mental and character traits of gifted children are better understood, it will be possible to set about their education with better hope of success.... In the gifted child, nature has moved far back the normal limits of educability, but the realms thus thrown open to the educator are still *terra incognita.* It is time to move forward, explore, and consolidate. (Terman, 1925, pp. 16-17)

Perception and Perceptual Processing

The link between perception and our environment leads us to believe that the better we understand and perceive that environment, the more effectively we can interpret and respond to it. Consequently, if we wish to determine how knowledge is gained about the environment, then we must first determine how our senses provide us with this knowledge.

Research on children's learning nearly always begins with theoretical assumptions about how learning takes place. For example, "A small child, like a great painter, reacts to his experience through his particular readiness to respond. His past experience, culture, personality and development all contribute. His personal art and his respone to the art of his society are both dependent on his ability to handle visual information." (McFee, 1961, p.183) The existence of these states of readiness implies variation and differences in the perceptual development of children. Many theories have been developed in an attempt to explain a child's responses to such visual information.

Perceptual Theories

Early theories suggest that perception is learned through association from past experiences, and knowledge acquired through the senses. In the mid 17th Century, the founders of the empirical school of thought, Hobbes, Locke, Berkeley, Hume, Hartley and Mill believed that knowledge was acquired through the senses and derived from prior experience.

Berkeley (1709) claimed that "touch educates vision", which is echoed in the current theory of Zachkowsky, Zachkowsky and Martinek (1980), who maintain "that movement is essential for the development of perceptual skills and that both of these skills are essential for cognitive learning." (p.78)

Wertheimer's paper (1912) on the Gestalt Theory of perception suggests that the brain sees total images or perceptual wholes rather than seeing objects as the sum of directly observed parts. At an early age, the child uses symbolic representations with little detail to suggest an image. These symbolic representations are termed percepts, and become more complex as the child matures.

Hochberg (1964) suggests that, "The Gestaltists general aim was to re-analyse our perception of the world." (p. 83) He credits Wertheimer (1920) with establishing the Gestalt laws of organization, and the Gestaltists with compiling lists of factors that influence the perception of shape.

Bruner and Postman's (1955) Directive-state theory suggests that structural factors determine the extent to which needs, attitudes, values, past experiences and other behavioural factors influence perception. This theory was further developed into the Hypothesis Theory which suggests that perception and other cognitive processes act as unconscious hypotheses, drawing "answers" from experience.

The Cell-Assembly Theory, most often linked with the name of Donald O. Hebb (1949), offers an explanation for perceptual growth. Hebb suggests that the identification of visual percepts is gradually learned through repeated experience. A simple percept or cell assembly is formed by fixation on parts of an object, which activates a number of nerve cells in the cortex. The cell assembly system develops as the eye moves from one fixation point to another. The assemblies facilitate each other through electrochemical action resulting in more complex percepts or a compound of cell assemblies. He concludes that sensory fixations (or cell assemblies) are made possible through movement, thus offering greater opportunity for the formation of perceptual constancies and visual concepts which are the outcome of perceptual development.

In 1959 Doman and Delacato emphasised the interdependent components of perceptual and motor processes of the individual to move, grow and learn. Like other perceptual-motor theorists such as Held and Hein (1963) and Frostig (1966) they believed that movement is essential for perceptual development; both of which are essential for cognitive development.

McFee (1961) in her Perception-Delineation Theory suggests six stages accounting for individual differences and identifies psychological, cultural and anthropological factors which affect learning. These stages identify readiness, (the way in which the child perceives his world), psycho-cultural transaction with the classroom, visual-physical environment, information handling (the child's intellectual ability to organize the information he receives), creative delineation (his ability to communicate responses), and evaluation of feedback and transfer. Each of these stages has up to seven sub-categories for more detailed indentification. She refers to these stages or transactions as "a process in which two or more factors interact and in the process each influences the condition and subsequent behaviour of the other." (p. 250)

The three kinds of visual qualities necessary for developing percepts used for thinking processes include:-

a) the abstract affective quality of art
b) the abstraction of visual information into a symbol which can be expressed, and
c) the structure or organisation

McFee goes on to suggest implications for teaching related to artistic perception and basic to cognitive processes.

Theories on how children perceive what they see, seem to make it apparent that most theorists accept that perception is learned through responses to the senses, and that perception is influenced by past experience of some form or another.

Defining Perception

As early as 1651 Hobbes wrote "There is no conception in man's, and which hath not at first, totally or by parts been begotten upon the organs of sense." (p. 87) Hochberg (1964) declares that "the study of perception is primarily psychological" and that it was not "until the early part of this century, to explain all of the possible thoughts or ideas we have by their origin in past and present sensory experience." (pp. 4,5)

Sensory impressions are received through different sense modalities such as visual, auditory, tactile, olfactory and gustatory. Rock (1975) suggests that central problems of perception are more clearly identifiable in vision. In 1950 Held and Richards defined perception as "the process of knowing objects and events in the world by means of the senses." (Held & Richards, 1950, p. 166) They suggest that,

> The processes upon which perception depends are governed by certain principles, including those of lateral inhibitions, convergence and divergence of neural pathways, and encoding of inputs into neural impulses which precludes the transmission of unaltered patterns. (p.166)

Simply stated, the information received by the senses is processed through the nervous system resulting in perception.

Lovano (1969) explains perception as "the direct apprehension of objects and of their relationships to situations and events that are physically present to the senses. In addition to the process of sensing there occurs some supplementing, interpreting, intergrating and differentiating of sensory impressions." (p. 4)

Rosinski (1977) suggests that "the developmental changes that occur in perceptual ability are the result of changes in the way stimulus information is picked up and used." (p. 204) Attneave (1971) sees perception as basically "an information handling process." (p. 183) This information is received on the retina of the eye, processed by the brain, resulting in the perception of a visual stimulus.

Hubel's (1963) explanation of the visual system suggests that, "An image of the outside world striking the retina of the eye activates a most intricate process that results in vision: the transformation of the retinal image into a perception." (p. 148)

Rock (1975) suggests that perception is the immediate experience of a stimulus object in terms of its properties. He states that "in the study of perception it is the appearance of things that is the focus of attention rather than the objective reality." (p. 3) Rock explains perception as objects and events in the real world being transferred to the sense organs (by light, sound waves, etc.) and triggering signals to the brain producing relevant brain events which in turn produce the perceptual experience.

The Nature of Perception

Attneave (1954) in his explanation of perceptual information processing suggests that "a major function of the perceptual machinery is to strip away some of the redundance of stimulation, to describe or encode incoming information in a form more economical than that in which it impinges on the receptors." (p. 189) That is, extraneous information is discarded and the recognised image retained.

Frostig (1966) believes perceptual deficits are responsible for learning disabilities in children. She emphasizes the need to develop several basic visual skills. These include visual and motor co-ordination, figure-ground perception, perceptual constancy, perception of positions in space, and perception of spatial relationships.

Supporting this view Barsch (1968) claims that perceptual processes (visual, auditory, tactual, kinestetic, gustatory and olfactory) are antecedents to intellectual development.

The effects of a hundred years of study in perception may be seen in two definitions. The first, by Helmholtz (1867) suggests that a great deal of what we perceive depends on our being able to make rapid and automatic inferences. Helmholtz was an empiricist who believed that what a person sees is affected by past experience. He debated whether perceptual abilities were innate or acquired. His view was that we perceive cues previously associated with an object and infer what they signify. These inferences, he suggests, are unconscious and thus automatic. They are also inductive, based on the assumption that a relationship which exists in the past will continue to apply to the present.

The second definition by Frisby (1980) suggests that in order to encompass all form of perceptual processing

> the problem of seeing is best tackled by a combined assault using psychological, physiological and computational methods in unison... The psychologist provides the methodologies for studying the input-output (retinal image-to-perception) performance of the best visual systems presently known... the physiologist studies the hardware of biological visual systems directly, using microelectrode recordings and neuroanatomical probings... and the computational scientist takes the

> job of actually trying to build a visual system. He tends to study the fundamental processing requirements of a given visual processing task. (pp. 156-7)

and determines what strategies might solve the problem.

In studies of perception (Bruner, 1958, Bruner, Goodnow & Austin, 1956) Bruner suggests that humans have an extensive and sensitive capacity for making distinctions within a wide range of sensory experiences. He claims that individuals progress through a perceptual decision-making process, which involves categorization of a group of objects by common characteristics. This categorization process is in fact the method by which children perceive and respond to art through visual cues by drawing upon visual experience from the past. "Categorization", according to Bruner is "man's ability to render discriminately different things equivalent, to group the objects and events and people around him into classes and to respond to them in terms of their class membership." (p. 1)

The four stages involved within the categorization process include "1) a primitive scanning operation in which an object or event is isolated from the complexity of environmental stimulation; 2) levels of cue searching where efforts are directed toward seeking out cues that can be fitted to available category specification, 3) a tentative categorization and an examination of confirmatory cues to check the validity of categorical placement, and 4) a final categorization, categorized by a termination of cue search." (p. 15) Here, the individual scans a picture, recognises as many features as he can, then matches these to category specifications in order to make a postive identification.

McFee (1966) prefers to think of this categorization process in terms of perceptual ability. Accordingly she argues that, "the primary visual perception abilities are organisational, seeing similarities, differences, proximities, continuities, closures, and figure and ground; and spatial, seeing objects in differing degrees of light, distance, and viewpoint relationship." (p. 251) However, she suggests that the individual screens visual input through past experiences and personal abilities. Thus, "the information reflected on the retina of the eyes is not totally of visual perception." (p. 183)

The screen McFee mentions, determines what information the individual will extract from his view and will choose to categorize into previously developed concepts. Concepts are defined as "an idea about an object, generalized from previous experiences with the object". (McFee, 1970, p. 148) She suggests, "that depending on whether an individual's training has been more cognitive than visual,... they will respond to their visual world more in terms of what they know about rather than what they see... Psychologists call this tendency to compromise between what is known and seen the perceptual constancies." (p. 184) McFee's definitions for brightness and colour, size, shape and distance and depth constancies follow.

"Brightness and colour constancy is a tendency to see objects as having the same colour and same brightness, regardless of the particular colour of light or shade they are seen in at a given time." (p. 65)

"Shape constancy is a tendency to see things as being the same shape regardless of the angle from which they are viewed." (p. 66)

"Size constancy is a tendency to see objects as being the same size or as having compromised size rather than as the actual comparative size, depending on the distance between the object and the viewer." (p. 65)

Munsinger (1971) states,

> The visual system somehow considers the relation between distance from the retina and plane of view to correct visual distortions. The perceived state of objects remains constant even when their distances and corresponding retinal images vary - for example, a man does not seem to shrink as he walks away from us. Furthermore, as the viewing angle of an object, and its corresponding retinal image varies, the object is still seen as the same shape. (p. 89)

The corrective mechanism is within the perceptual system which corrects the retinal projection and stabilizes the representation of the world.

Size and Distance Perception

Piaget (1969) suggests that "constancies do seem to evolve and, on the whole, (to) improve with age." (p. 206)

Later in relation to size constancy he suggests that, "There is no reason, in principle, why a visual perception should not exist which depends only on variable apparent sizes and on distances." (p. 229) That is to say that size and distance should be the sole variables in the identification of an object.

Piaget emphasizes the concept of size and distance constancy. In simple terms, this may be described as follows: If you were to look down a lane to see a friend, that friend would appear very small. You know that your friend hasn't diminished in size, but in fact, the distance makes him appear smaller than you know he actually is.

Gregory (1968), in his explanation for the process of size constancy, suggests that both illusion and constancy are outcomes of the same central process, a process that determines the size of ambiguous stimuli. Kaufman and Rock (1962), on the other hand, suggest that an apparent change in size is caused by an apparent difference in the distance from the observer.

Space Perception

Ralph Haber (1978) in his article "Visual Perception" deals with three areas: a) perception of three-dimensional scenes including two theories of space perception, b) perception of pictures and flat displays including visual illusions, and c) the perceptual components of reading.

Hagan and Bresnahan (1984) suggest that information in the form of structured light to the eye is processed to result in visual perception. Gibson (1966) refers to this structured light as the "optic array" which offers information to determine objects and events. Gibson (1960) repeatedly refers to light stimulus to the eye providing information in her "visual cliff" experiments. In experiments conducted with infants and animals using a "visual cliff", Gibson and Walk (1960) found that a child avoids falling over the edge of a "cliff" by referring to visual depth cues.

As an outcome of the "Visual Cliff" experiments, Gibson and Walk suggest that, "Height perception is a special case of distance perceptions and information in the light reaching the eye provides stimuli that can be utilized for the discrimination both of depth and of receding distance on the level." (p. 341) They concluded that the response to the "Visual Cliff" experiments demonstrated the vital role of vision in the survival of the species.

In their interpretation of depth perception, Held and Richards (1950) suggest that when one object is in front of or behind another, that information may be conveyed by many different stimulus conditions.

> One of these is retinal disparity, a simple result of the geometry of the light rays coming from an object to the eyes, whereby two retinal images of an object differ slightly in size, shape, and location. When two objects lie at different distances from the eyes, the horizontal distance between their images on the right retina differs from that of their images on the left retina. Such a disparity varies monotonically with the magnitude of the difference in distance of the objects from the eyes, providing the observer with information about their depth in his visual field. (p. 233)

In summary, McFee (1970) suggests that perceptual constancies are "the tendencies to depend upon what is known about objects rather than upon the direct sensory data received about them. People tend to 'see' things in terms of the colour, size and shape they know them to be, irrespective of visual images that result from differences in light, distance from the object, or the viewing angle of the object," and that "Past experience varies the ways individuals respond to the constancies", just as "values and attitudes influence the way objects are seen in space." (p. 77)

Perceptual Stability

Haber (1978) in his explanation of perceptual stability suggests two components: 1) how we know the properties of the visual world from sense information and 2) how the visual world stays put even as we move through it. Haber acknowledges that "once it is granted that the retinal image contains sufficient information to completely specify space, then it must contain information about the object size, shape, brightness, and so forth." (p. 39)

Multistability and Ambiguity

Frisby (1980) suggests that "Each eye's retinal image, which initiates the whole process of seeing, is inherently ambiguous. Various measurements are taken from it, and these are interpreted to give the required identification of attributes of the scene." (p. 156)

Multistability of perception has been the focus of studies by Attneave (1971) who claims that if an ambiguous figure provides the viewer with two "alternative representations or descriptions of visual input (which) are equally good, the perceptual system will sometimes adopt one and sometimes another." (p. 91)

He goes on to explain that "under natural conditions many factors co-operate to determine the figure-ground relationship, and ambiguity is rare." (p. 92) The Rubin (1915) reversible goblet is frequently used as an example of figure-ground reversal. Many of Escher's pictures offer excellent examples of figure-ground reversals, in the positive and negative spaces.

In reference to ambiguous figures Munsinger (1971) offers an explanation he terms "perceptual sets".

> The type of experience one receives just before viewing an ambiguous figure strongly affects what he sees. This phenomenom (called perceptual set) is not well developed in young children. (p. 100)

The existence, or lack thereof, of this "perceptual set" may offer the teacher as indication of a child's perceptual development.

Visual Illusion

Hochberg (1964) writes that "What we observe is never in exact correspondence with the physical situation. Some aspects are omitted, some added, some distorted. An illusion exists when observations made with the aid of a physical instrument yield different results from those made without such instruments." (p. 3) As an example, Hochberg cites Mueller-Lyer figures of perceived length verses measured length.

Tests & Measures

Prior to the 1950s, the Stanford-Binet Intelligence Test was the instrument most used to determine varying individual intellectual ability. The guidelines suggest that a gifted child is one with an IQ score of greater than 130. However, in the early 1960s researchers and educators alike began to question the validity of standardized measures and tests to identify gifted and talented children. These tests were typically verbal, thus identifying intellectual giftedness, rather than superior ability in arts, music, performing arts, mechanics and other fields characterized by non-verbal ability.

The work of Guilford (1972), Torrance (1974), and Renzulli (1979) has contributed to making a variety of techniques, procedures and instruments available for identifying gifted and talented children. Renzulli (1982) suggests that IQ or other ability scores cannot, by themselves, account for creative/productive giftedness. He stresses the importance of "creativity and task commitment as a characteristic in the gifted person, and the need for a more flexible identification system." (p. 13) Guilford declares "The Stanford Revision of the Binet intelligence scale has been the standard against which all other instruments for the measurement of intelligence have been compared." (p. 350) Maker (1982) contends "J. P. Guilford's (1959, 1967) theory of the structure of human intelligence has no doubt had a greater influence on the field of education of the gifted than any other theory or model." (p. 87)

Torrance (1959) in an exploratory study of creative thinking used a number of Guilford's tests with grades four to six. On the six measures he used, he found no statistical difference between the high IQ and the highly creative group. The high IQ group scored significantly higher on best friends criterion in peer nominations. However, both groups were rated equally high as learners and talkative individuals.

Torrance (1962) wrote "There has been increasing recognition of the fact that traditional measures of intelligence attempt to assess only a few of man's thinking abilities." (p. 8) Cognitive abilities not concerned with creative thought are often not measured by conventional intelligence tests, thus failing to take full account of the creative child. From these results, Torrance developed The Torrance Test for Creative Thinking (1972, 1974) which emphasizes fluency, flexibility and elaboration.

Although a number of tests have been designed to measure art ability or art aptitude, only a few are still in print. These include the Tests in Fundamental Abilities in the Visual Arts (1927), the Knauber Art Ability Test (1935) which measures artistic knowledge or preference, the Meier Art Test (1937), the Graves Design Judgement Test (1948) and the Horn Art Aptitude Scale (1953). However, most of these tests have become obsolete.

As early as 1941 Norman Meier was developing tests and measuring artistic ability, with a central interest in gifted children. "He isolated factors which he felt contributed to artistic talent: 1) manual skill or 'craftsman' ability, 2) energy output and perseveration in its discharge, 3) general and aesthetic intelligence, 4) perceptual facility, 5) creative imagination, and 6) aesthetic judgement." (Meier, 1966, orginally 1939)

However, Alexander (1981) offers criticism of several of these major factors, claiming that the first three are primarily hereditary, while the remainder are primarily acquired but interacting with the conditions imposed by heredity factors. Further, she claims that Meier's tests are culture bound and invalid with children under 12.

Passow (1981) points out that "the definition of gifted and talented provides the direction for the selection and use of identification procedures and for the design of educational opportunities and differentiated curricula. In fact, the procedures and techniques used for identification affect the kinds of differentiated experiences to be provided and vice versa: identification is viewed as an integral part of differentiation." (p. 14)

Some measures of indication of giftedness may include standardized group tests, culture fair tests, creativity tests, special aptitude tests, school achievement, parental, teacher and peer and self nominations, personality and behavioural checklists.

Standardized Group Tests

These tests may have limitations as tests of giftedness in that they

a) are designed for average students - ceilings too low to discriminate between bright and gifted students

b) to achieve "objectivity" by limiting responses to "correct" answers, thus eliminating creative responses.

c) rely on printed words thus jeopardizing high scores among students with reading problems or children from different cultural backgrounds.

The Wechsler Intelligence Scale for Children - Revised (WISC-R 1974) and the Stanford-Binet Intelligence test are the two most widely used tests for measuring general intellectual ability in children. The WISC-R determines specific academic aptitude with three scores: a verbal IQ, a performance IQ and a total IQ. The division of the verbal performance categories allows children poor on verbal ability to show intellectual strength on performance IQ.

Culture Fair Tests

These tests avoid cultural bias, thus they are useful for schools with large minority populations. Often these tests rely heavily on non-verbal questions and responses e.g. the Columbia Test of Mental Maturity which requires individual response from several figural items. Youngblood (1979) noted that "of the 215 tests and measures reported in Studies in Art Education (1973-1974, pp. 57-62), only 9% focus on objective measures of non-verbal ability." (p. 52) Standardized Tests and Culture Fair Tests generally require one correct answer and therefore fail to indicate traits such as divergent thinking commonly associated with creativity.

Individual IQ Tests

The Stanford-Binet and WISC-R are the most widely used and focus on general intellectual ability. These tests do in fact identify "gifted" individuals. A disadvantage to the classroom teacher is that these tests need to be administered individually by trained personnel.

In 1973 Machen conducted a validity and reliability study of the Slosson Intelligence Test (SIT) with gifted children and used the WISC for a comparison. The SIT was found to be a reliable measure for determining giftedness with the highest correlation at the nine year old level. The SIT then, appears to be a useful diagnostic measure for the classroom teacher or unqualified personnel who wish to perform initial testing with children.

Norma Pearce (1983) conducted a comparative study using the WICS-R, Raven's Standard Progressive Matrices, and Meeker's SOI-Screening Form for the Gifted. These three instruments were used for the following reasons. The WISC-R is one of the two most widely used placement instruments yielding both Performance IQ and Verbal IQ. It is respected for its high reliability and validity co-efficients. The Raven's Standard Progressive Matricies which measures reasoning by analogy, was the non-verbal instrument recommended for identifying underachievers and disadvantaged gifted children. The Meeker's Structure of Intellect Screening Form for the Gifted is an instrument published in 1980, which measures 24 of Guilford's (1967) intellectual abilities. Its purpose is as much a prescriptive as a diagnostic tool, measuring a variety of verbal and non-verbal abilities. The results of Pearce's research revealed that dimensions of intellectual functioning were significantly related on all three tests, with the relationship between the WISC-R and the Raven's SPM being the stronger.

The abovementioned tests attempt to quantify the individual's ability. However, in order to allow for potential giftedness and minimize test limitations it may be necessary to view the children's art work, gain opinions from others in specialized fields, and review previous records, leaving the IQ measure to serve only as a general indication of ability.

Hermelin and O'Connor (1980) performed a study using an IQ measure to "distinguish an analytic or convergent form of intelligence from a divergent or associational form" (p. 180) similar to factors identified in Torrance's list for creativity. They questioned whether or not "more able people perform better on most cognitive tasks than less able ones." (p. 180) The outcome of the study revealed that "high ability on specific tasks can (not) be accounted for by a high IQ alone." (p. 185) The implications of this study reveal that while a higher than average IQ is indicative of cognitive performance, and certainly of giftedness in certain areas of achievement, it cannot be used as a sole measure.

Tests for Special Aptitudes

There have been tests designed specifically to determine creative artistic ability.

> Clark and Zimmerman (1983) report that, despite [the] criticisms of standardized art tests, the Centre for Global Futures (1981) lists 52 formal instruments currently available for use in identifying gifted and talented students. Three of these formal instruments are designed as

> tests of art aptitude. The Graves Design Judgement Test (1946, 1974, 1978) measures aptitude for the appreciation or production of art; The Horn Art Aptitude Inventory (1953) tests aptitude for art production; and the Meier Art Tests (1929, 1942, 1963) measure aesthetic sensitivity. None of these tests however, have been proven reliable and valid for the prediction of artistic talent. (p.182)

Frostig's Developmental Test of Visual Perception (1964), measures developmental levels of a child's ability in various tasks involving visual perception. She contended that it was not sufficient to recognize and evaluate a single component of perception. Her tests therefore attempted to identify five different areas of perceptual skill. These are: eye-hand coordination, figure-ground discrimination, constancy of shape, position in space, and spatial relations.

The results of this test can be translated into a perceptual age, perceptual quotient and scaled scores as a whole and for each subtest. However, unlike the MacGregor Perceptual Index, with its seven subtests, Frostig's test is primarily performance based and used to diagnose younger children with visual-motor handicaps.

Kellogg (1970) offers an age-stage sequence that she relates to cognitive development in children's art, while Harris (1963) believes that the Draw-a-Man Test measures a child's ability to perceive and generalize about likeness and difference in form. Since none of these tests offer a sure means of identification, this reaffirms the notion that many means of measurement should be employed for a more accurate indication of giftedness.

Renzulli (1982) stresses the importance of creativity and task commitment as a characteristic of the gifted child, and the need for a more flexible identification system.

He recommends check lists, sociograms, observations over time, journals by teachers and children as a means of identifying gifted children; these he claims to be more valuable than conventional testing. Munro sums up this idea suggesting that, "By a highly diversified set of test or experimental devices — some analysing work samples, some observing ability to remember visually, to learn a new technique, to defend preferences intelligently, and so on — we might approach the composite of diverse abilities known as 'art ability'" (p. 176)

Research appears to suggest that IQ or other ability scores cannot by themselves account for creative/productive giftedness. Alexander (1980) recommends that "new evaluation methodologies are necessary to cope with the complexity of the gifted child in a gifted program....a different curriculum that satisfies the intellectual, artistic and creative needs of gifted and talented students is not only possible but necessary." (p. 45)

To conclude this section, Lark-Horovitz (1967) points out that,

> it is not mere precocity in visual realism that we must look for as a sign of artistic talent (though this may well occur as one indication), but rather such characteristics as perceptual, imaginative, emotional alertness, directed by preference into visual materials....we must read between the lines of their (test) results, not judging

> them for obvious signs of maturity, special training, or sophistication. Rather we should look for signs of that vitality, sensitivity, eagerness, inventiveness, and organizing power which distinguish excellence from mediocrity at every age level and at every stage of cultural development." (p. 178)

On these tests students need not perform specific artistic tasks to be identified as potentially talented. As qualities of giftedness vary there appears to be a need to isolate and identify specific aspects of giftedness and use tests appropriate to the quality being defined.

The MacGregor Perceptual Index (MPI)

The Index used for this study is intended to identify visual aspects of perceptual efficiency at the elementary school level. The child interprets visual information from photographs in order to choose a correct response from various alternatives. The instrument is designed to elicit responses in the following categories: perception of distance, perception of embedded figures, perception of shape, perception of similarities and differences, perception of the vertical, perception modified by constancy and perception of contour.

MacGregor points out that the instrument "was designed to provide teachers of art with a valid and reliable measure of response to visual stimuli." (p. 17) The MPI offers the generalist elementary teacher an instrument that can be administered without specialized training. Scoring is by means of one correct answer, which avoids subjective marking. Because this is a non-verbal measure of visual acuity, it may identify children with verbal difficulties, children with language barriers, or gifted children not diagnosed by traditional verbal tests of intelligence. MacGregor suggests that through "a deliberate structuring of experiences within the art program" the ultimate and desired goal is to help children "towards a more adequate understanding of their visual world." (p. 61)

Behavioural Characteristics

Tuttle and Becker (1980) have assembled characteristics and behaviour checklists and suggest that children displaying the greatest number of these can be identified as artistically gifted. A few typical characteristics reflecting giftedness include: curiosity, persistency in pursuit of interests and questions, perceptive of the environment, critical of self and others, sensitive to injustices on personal and worldwide levels, highly developed sense of humour, just to list a few. (p.13)

Teacher, parent, peer and librarian nominations were all taken into account when diagnosing the group of gifted children used for the purposes of the author's study. Scholastic records representing levels of competency aid in the identification process, but can be misleading if interpreted incorrectly. For example, gifted children often have a strange sense of humour. (p. 19) Laughter at an inappropriate time may be misinterpreted by the teacher as disruptive behaviour.

Frank Chetelat (1981) looked at the identification strategies of Lowenfeld (1964) for identifying gifted children and also the characteristics attributed to artistically talented children by Lark-Horovitz, Lewis and Luca (1976) and combined this information with "personal observation, nomination forms and portfolios of artwork. His concern as an art specialist in an elementary school was to provide a highly interesting and challenging visual arts program for the gifted within the regular art classroom." (p. 156) He advocated station learning and focused his finding on a specific art activity, visual concepts learned, challenges for advanced learning, and responses of identified children.

Zettle (1979) recommends a number of means of identifying the gifted and talented, and the potentially gifted and talented for selection into special programs. He suggests that initial screening should include:

> a) recommendations by self, staff, parent peer and others; b) nominations by specialists in the visual and performing arts within and outside the schools; and c) a behavioural checklist. For a final screening a panel of experts will judge submitted projects, auditions and/or interviews. Behavioural checklists and standardized aptitude tests should be used by experts to look for children with potential but undemonstrated talent. The appropriate placement of students selected for programs in the visual and performing

> arts should be based upon their potential as well as their demonstrated proficiency in the area of talent. (p. 69)

Summary

This chapter has described the research concerning giftedness including the diverse qualities defined in giftedness. It has also dealt with the definition of perception, how perceptual growth might be measured, and how assessment of giftedness might be undertaken. Research relating to the gifted and talented highlights some of the characteristics and behaviour of children in this group.

CHAPTER THREE

STUDY PROCEDURES

The Methods of the Study

This study focused upon problem-solving processes associated with visual perception, and examined evidence of those, in the form of scores on the MPI, to determine whether a relationship might exist between visual perception and intellectual ability in Australian primary school children in grades five and six. This chapter describes the data-collecting procedures used in the study, and the statistical procedures employed in analyzing the data.

Procedures

The main steps used in gathering data for this study were a) selecting the population b) selecting the sample c) obtaining permission to gather the data and d) administering the instrument.

Selecting the Population

According to Piaget (1962) and Lowenfeld (1970) perception levels of development have stabilized at about the age of ten. It therefore seemed appropriate to test visual perception in relation to intelligence at this age level.

The grouping of gifted children available for research within Canberra occurred at the grade five/six level, and therefore constituted an acceptable population for this study. Although a grade four class was available as a gifted group, this group was rejected on the basis that they might not have reached a level of cognitive development where comparison with non-gifted children would be productive for the purposes of this study.

Population Defined

The population of regular classroom children for the study consisted of the total population of grade five and six students who responded to the Principal's authorization form at Primary School A, a copy of which can be found in Appendix C of this study. The population of gifted children for the study consisted of the total population of pre-diagnosed gifted children from grade five and six at the Primary School B.

Selection of the Sample

The sample consisted of two intact groups; twenty-four subjects between the ages of 10-12 from Primary School B and a similar sample from Primary

School A. The ratio of boys to girls was approximately equal in both groups.

Socioeconomic differences between samples might have contaminated the test scores. An effort was made to minimize those differences, by consulting with the Schools Authority on socio-economic ranking of schools within the A.C.T. Since School B, containing the gifted sample, was a necessary choice and ranked 32 on the Schools Authority scale, (included as Appendix F) the next obvious choice was either 31 or 33. School A ranked 31, and was chosen to provide the non-gifted sample.

Obtaining Permission to Conduct the Study

As the study involved more than one school, permission to collect data was required from the A.C.T. Schools Authority. This was granted, along with the co-operation and support of the school principals. (See Appendix C for principals' authorization letters sent to parents). Each child was given a permission slip to take home, for parental approval.

The Instrument

The MacGregor Perceptual Index, selected as the instrument for this study, is intended to identify aspects of visual perceptual efficiency at the elementary school level. The child interprets visual information from a series of photographs in order to choose a correct response from various alternatives within the following categories: perception of distance, perception of embedded figures, perception of shape, perception of similarities and differences, perception of the vertical, perception modified by constancy, and perception of contour.

Pilot Study

Prior to the regular testing schedule a small selection of grade 5/6 children (not in the population to be tested but of the same age group, 10-12 years) were given the MacGregor Perceptual Index Test in order to familiarize the administrator with the test. This was administered under conditions similar to those to be observed in the testing program. Each question was read individually and the children were given the recommended 10 seconds to respond.

Administrative Instructions for Testing

Students were sent to the appointed room at an agreed time in groups of no more than six. On entering the room the children were instructed to sit at tables and chairs arranged within the room. Each table was set with a test booklet, an answer booklet, an eraser and a pencil.

The children were asked to write their name, grade, age and 'B' or 'G' to denote whether they were boy or girl. They were then told to listen to the following instructions carefully. The instructions delivered were identical to those recommended and used by MacGregor in his study. (See Appendix C for test administration instructions, original and modified answer sheet, and test booklet as used by MacGregor and this researcher.)

To minimize disruption in school routines, the tests given to the non-gifted group were conducted during times when each group was normally scheduled for a library study period. This provided one uninterrupted hour for five different groups on three consecutive days. Although the author of the test materials suggested a procedure time of thirty minutes, this researcher found administration time to be closer to forty minutes. The gifted group were tested on three consecutive days. All testing was conducted before the noon hour.

At Primary School A, testing was conducted within the media room. This room was familiar to all the children, and was associated with pleasant learning experiences. Rather than being a pressure period, time assigned to the media area is considered enrichment for those keen enough to try something new. At Primary School B, testing was conducted within the computer room (another area associated with enjoyment).

<u>Modifications to Administration of the Instrument</u>

Conducting this study in Australia created additional problems, especially in regard to the receipt of test materials, reference materials and advice, through an inadequate postal service. Due to initial difficulties in acquiring full copies of test procedures, booklets, and answer sheets, the researcher had cause to modify the administration of the test in the following ways:

1. Photocopies of the test booklet were used. This produced possible differences in the replication of tonal value in the photographs.
2. Some wording on the answer sheet had to be revised.

3. Some visual material in the answer sheets had to be redrawn.
4. The wording of the instructions to the pilot group was amended for the two tested groups.
5. The wording of some questions was altered to account for cultural differences. For example "the apartment blocks" was rewritten as "the block of flats", "freight cars" was rewritten as "train carriages", and "grain elevators" was rewritten as 'grain silo'.
6. Answer sheet page numbers and test booklet page numbers were altered to correspond to the modified answer sheet.

Since some of these revisions might be considered a threat to the internal validity of the test, a confirmation study, administered with a complete set of original materials and a similar group of previously untested children, was undertaken following the main testing period. It revealed insignificant variations in both administrative procedures and test results. Informal comparison of the original set of materials and the modified materials confirmed that the adapted versions used in the main testing sessions were close to the originals in spirit and content.

One difference noted was that the test took a maximum of forty minutes instead of the designated thirty minutes with both the original and modified materials. This may have been due to the reading pace of the tester administering the instructions, or it may have been the result of student requests for a reread of an instruction.

Statistical Procedures

The four groups included in data-collection comprised grade five gifted and non-gifted, and grade six gifted and non-gifted. Their raw scores were calculated and the Mann-Whitney U. one-tailed test of significance was performed to determine if there were any statistically significant differences between the four groups on the total score, and again with the four groups on each of the seven categories.

In determining the differences in the raw scores no distinction was made between males and females.

The formula used in all calculations was the Mann-Whitney U.

$$U = n_1 n_2 + \frac{n_1(n_2+1)}{2} - R_1$$

where U = the critical value

n_1 = the number of subjects in Group A

n_2 = the number of subjects in Group B

R_1 = the total of ranked scores from Group A

and $U_1 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2$

where U_1 = the critical value

n_1 = the number of subjects in Group A

n_2 = the number of subjects in Group B

R_2 = the total of ranked scores from Group B.

The Mann-Whitney U. was chosen because the normal parametric assumptions of the t test are not appropriate in this case. The null hypothesis is that the two samples have the same distribution.

Hypotheses Tested

This study sought to test the null hypotheses that:

a) there will be no positive statistically significant difference, at the .05 level of confidence, in the MPI results, between the scores of gifted children and the scores of non-gifted children on the scores for the perception of distance category;

b) there will be no positive statistically significant difference, at the .05 level of confidence, in the MPI results, between the scores of gifted children and the scores of non-gifted children on the scores for the perception of embedded figures category;

c) there will be no positive statistically significant difference, at the .05 level of confidence, in the MPI results, between the scores of gifted children and the scores of non-gifted children on the scores for the perception of shape category;

d) there will be no positive statistically significant difference, at the .05 level of confidence, in the MPI results, between the scores of gifted children and the scores of non-gifted children on the scores for the perception of similarities and differences category;

e) there will be no positive statistically significant difference, at the .05 level of confidence, in the MPI results, between the scores of gifted children and the scores of non-gifted children on the scores for perception of the vertical;

f) there will be no positive statistically significant difference, at the .05 level of confidence, in the MPI results, between the scores of gifted children and the scores of non-gifted children on the scores for perception modified by constancy;

g) there will be no positive statistically significant difference, at the .05 level of confidence, in the MPI results, between the scores of gifted children and the scores of non-gifted children on the scores of the perception of contour.

Reliability

According to MacGregor, "Pearson product-moment correlation coefficients were computed for split-half reliability, and a Spearman Brown prophecy formula applied to the total sample (N = 240) was .84 . . .

Pearson r's determining retest reliability amounted to .85 overall (N = 59)." (p. 13) This indicates an acceptable degree of reliability, and the instrument was adapted for use in this study without further testing.

<u>Validity</u>

MacGregor assessed the validity of the Perceptual Index "by observation of the internal consistency of the instrument as expressed in the relationship which each item had with the total test score; by correlating scores on the Perceptual Index with those gained on the Draw-a-Man task in the Goodenough-Harris Drawing Test, and with Non-Language scores on the California Test of Mental Maturity, and by noting whether a progressive increase in items scored correct occurred with each increase in grade level." (p. 13)

The MPI was used in a correlation study in 1973 with a selection of six cognitive tests published by the Educational Testing Service in 1963. Both sets of tests tests were compared to verbal, quantitative, and non-verbal intelligence as estimated by the Houghton Mifflin Cognitive Abilities Test (CAT).

The findings showed significant intercorrelations (P .01) between the MPI and the 6 ETS Tests. Concurrent validity was established between the ETS cognitive factor tests with the visual perception measures of the

MPI. Again, the figure for validity of the instrument was accepted as given, and assumed to be sufficiently firm for the purposes of the present study.

CHAPTER FOUR

ANALYSIS OF RESULTS

Presentation of the data in this study has been organized in the following manner:

a) The data presented consist of the raw scores of the four groups tested for the test as a whole and for each of the seven subtsets of the MacGregor Perceptual Index. Included are statistical assumptions, ranked scores, calculation of the critical values and a decision on acceptance or rejection of the null hypothesis.

b) The Mann-Whitney U was selected to determine post-hoc procedures of the results. Siegal (1956) considers this one of the most powerful of the non-parametric tests used to determine whether or not two independent groups have been drawn from the same population.

c) A commentary on the results of the statistical procedures is provided.

Analysis of the Data

Assumptions for the Statistical Tests are as follows:

a) The samples studied are intact and independent.

b) Ordinal data are appropriate for the measurement scale.

Breakdown of Groups:

Number of groups in population:	4
Group A: Gifted Grade 5	11
Group B: Non-Gifted Grade 5	13
Group C: Gifted Grade 6	13
Group D: Non-Gifted Grade 6	15
Total N	48

Significance Level: $p < .05$

Sampling Distribution: The probabilities associated with the occurrence under a null hypothesis of values as small as an observed U for n1, n2 require that scores of 41 and 62 respectively be achieved for a significant difference according to the Mann-Whitney U. (see Appendix F).

Mann-Whitney U Formula:

The formula used for the calculation of results:-

$$U = n1\ n2 + n1\ \frac{(n2 + 1)}{2} - R1$$

where U = the critical value

n1 = the total number of children in the first group

n2 = the total number of children in the second group

R1 = the total of the ranked scores in the first group

and

$$U1 = n1\ n2 + \frac{(n2 + 1)}{2} - R2$$

where U1 = the critical value

n1 = the number of children in the first group

n2 = the number of children in the second group

R2 = the total of the ranked scores in the second group

<u>Calculation of Critical Values</u>

(Refer to Appendix E: Extended tables of the Mann-Whitney U. for the critical values of U for a one-tailed test at .05.)

Table 1

MPI Raw Scores: Groups A, B, C & D Ranked

A		B		C		D	
33	13.5	20	24	26	27	22	28
35	11.5	27	23	33	22	27	26
35	11.5	30	20.5	34	20	32	24.5
36	9.5	30	20.5	35	18	32	24.5
36	9.5	30	20.5	36	14.5	33	22
37	7.5	30	20.5	38	8.5	33	22
38	4.5	31	18	38	8.5	35	18
38	4.5	32	16	38	8.5	35	18
38	4.5	32	16	40	4.5	36	14.5
39	2	32	16	40	4.5	36	14.5
40	1	33	13.5	41	3	36	14.5
		37	7.5	42	2	37	11.5
		38	4.5	43	1	37	11.5
						38	8.5
						39	6
n_1 11	R_1 79.5	n_2 13	R_2 220.5*	n_1 13	R_1 142	n_2 15	R_2 264

* p = $<$ .05

Table 2

Perception of Distance

MPI Raw Scores: Groups A, B, C & D Ranked

A		B		C		D	
5	6	5	6	6	2.5	6	2.5
5	6	5	6	5	9.5	6	2.5
5	6	5	6	5	9.5	6	2.5
5	6	5	6	5	9.5	5	9.5
5	6	5	6	5	9.5	5	9.5
5	6	4	14.5	5	9.5	5	9.5
4	14.5	4	14.5	4	18	5	9.5
4	14.5	4	14.5	4	18	5	9.5
4	14.5	3	20.5	4	18	4	18
3	20.5	3	20.5	3	23.5	4	18
3	20.5	3	20.5	3	23.5	4	18
		3	20.5	3	23.5	4	18
		2	24	2	27	3	23.5
						2	27
						2	27
n_1 11	R_1 120.5	n_2 13	R_2 179.5	n_1 13	R_1 201.5	n_2 15	R_2 204.5

Table 3

Perception of Embedded Figures

MPI Raw Scores: Groups A, B, C & D Ranked

A		B		C		D	
6	9	6	9	6	12.5	6	12.5
6	9	6	9	6	12.5	6	12.5
6	9	6	9	6	12.5	6	12.5
6	9	6	9	6	12.5	6	12.5
6	9	6	9	6	12.5	6	12.5
6	9	6	9	6	12.5	6	12.5
6	9	6	9	6	12.5	6	12.5
5	18.5	6	9	6	12.5	6	12.5
4	22	6	9	6	12.5	6	12.5
4	22	6	9	6	12.5	6	12.5
4	22	5	18.5	6	12.5	6	12.5
		4	22	6	12.5	5	25.5
		4	22	6	12.5	5	25.5
						4	27
						0	28
n_1 11	R_1 147.5	n_2 13	R_2 152.5	n_1 13	R_1 162.5	n_2 15	R_2 243.5

Table 4

Perception of Shape

MPI Raw Scores: Groups A, B, C & D Ranked

A		B		C		D	
6	2	5	6	8	1.5	8	1.5
6	2	5	6	6	6.5	6	6.5
6	2	4	12.5	6	6.5	6	6.5
5	6	4	12.5	6	6.5	6	6.5
5	6	4	12.5	6	6.5	6	6.5
5	6	4	12.5	5	14.5	5	14.5
4	12.5	4	12.5	5	14.5	5	14.5
4	12.5	3	18.5	5	14.5	5	14.5
4	12.5	3	18.5	4	22	5	14.5
3	18.5	3	18.5	4	22	5	14.5
2	22.5	2	22.5	4	22	4	22
		2	22.5	4	22	4	22
		2	22.5	3	26.5	4	22
						3	26.5
						2	28
n_1 11	R_1 102.5	n_2 13	R_2 197.5*	n_1 13	R_1 114.5	n_2 15	R_2 220.5

* p = $<$ .05

Table 5

Perception of Similarities and Differences

MPI Raw Scores: Groups A, B, C & D Ranked

A		B		C		D	
5	5	6	1	6	2	6	2
5	5	5	5	6	2	5	5.5
5	5	5	5	5	5.5	4	11.5
4	15	5	5	5	5.5	4	11.5
4	15	5	5	5	5.5	4	11.5
4	15	4	15	4	11.5	4	11.5
4	15	4	15	4	11.5	3	20.5
4	15	4	15	4	11.5	3	20.5
4	15	4	15	4	11.5	3	20.5
3	22.5	4	15	3	20.5	3	20.5
3	22.5	4	15	3	20.5	3	20.5
		4	15	3	20.5	3	20.5
		2	24	1	28	3	20.5
						2	26.5
						2	26.5
n_1 11	R_1 150	n_2 13	R_2 150	n_1 13	R_1 156	n_2 15	R_2 250

Table 6

Perception of the Vertical

MPI Raw Scores: Groups A, B, C & D Ranked

A		B		C		D	
6	1.5	6	1.5	5	3.5	6	1
5	7	5	7	5	3.5	4	11.5
5	7	5	7	5	3.5	4	11.5
5	7	5	7	5	3.5	4	11.5
5	7	4	14	4	11.5	4	11.5
5	7	4	14	4	11.5	4	11.5
5	7	3	18.5	4	11.5	4	11.5
4	14	3	18.5	4	11.5	4	11.5
4	14	3	18.5	4	11.5	3	22
4	14	2	22	3	22	3	22
3	18.5	2	22	3	22	3	22
		2	22	3	22	3	22
		1	24	2	27.5	3	22
						3	22
						2	27.5
n_1 11	R_1 104	n_2 13	R_2 196*	n_1 13	R_1 165	n_2 15	R_2 241

* p = $< .05$

Table 7

Perception Modified By Constancy

MPI Raw Scores: Groups A, B, C & D Ranked

A		B		C		D	
9	2	8	6.5	9	3.5	9	3.5
9	2	8	6.5	9	3.5	9	3.5
9	2	7	12	9	3.5	8	12
8	6.5	7	12	9	3.5	8	12
8	6.5	6	16.5	8	12	8	12
8	6.5	6	16.5	8	12	8	12
8	6.5	6	16.5	8	12	8	12
7	12	5	21	8	12	8	12
7	12	5	21	7	21	8	12
7	12	5	21	7	21	7	21
6	16.5	5	21	7	21	7	21
		5	21	7	21	6	26
		4	24	7	21	6	26
						6	26
						4	28
n_1 11	R_1 84.5	n_2 13	R_2 215.5*	n_1 13	R_1 167	n_2 15	R_2 239

* $p = < .05$

Table 8

Perception of Contour

MPI Raw Scores: Groups A, B, C & D Ranked

A		B		C		D	
6	8.5	6	8.5	6	10	6	10
6	8.5	6	8.5	6	10	6	10
6	8.5	6	8.5	6	10	6	10
6	8.5	6	8.5	6	10	6	10
6	8.5	6	8.5	6	10	6	10
6	8.5	6	8.5	6	10	6	10
6	8.5	5	17.5	6	10	6	10
6	8.5	5	17.5	6	10	6	10
6	8.5	4	20	6	10	5	21.5
6	8.5	4	20	6	10	5	21.5
4	20	3	22	6	10	5	21.5
		2	23.5	5	21.5	4	25.5
		2	23.5	4	25.5	4	25.5
						4	25.5
						3	28
n_1 11	R_1 100.5	n_2 13	R_2 195*	n_1 13	R_1 157	n_2 15	R_2 251

* $p = < .05$

Analysis of Results

On the basis of the Mann-Whitney U scale, the null hypothesis was rejected for the comparison groups A & B (Grade 5), and for comparison groups C & D (Grade 6) for the raw scores of the total test. The results indicated that there existed a statistically significant positive difference in scores by gifted and non-gifted Grade 5 samples and gifted and non-gifted Grade 6 samples, on test results overall. Among the Grade 5 groups, significant differences were also evident in the categories: perception of shape, perception of the vertical, perception modified by constancy and perception of contour.

There were no statistically significant positive differences among the gifted and non-gifted Grade 6 groups within any individual category. This may be attributed to "increase in accuracy of perception and awareness of details which reaches a maximum and levels off at approximately age ten." (Burkhart, 1958, p. 160) The Grade 6 group may have reached this plateau whereas there may have been less equality within the Grade 5 groups, particularly in the case of the non-gifted.

Analysis of the answer sheets showed which questions were typically answered incorrectly.

Item Analysis by Category

Category ONE: Perception of Distance

Table 9

	Correct Responses			
	Gifted		Non-Gifted	
Question	Grade 5	Grade 6	Grade 5	Grade 6
1	12	12	13	14
2	12	12	12	14
3	11	11	9	12
4	4	8	4	6
5	5	7	4	8
6	8	5	7	11

There was a total of 52 responses to each question; 28 from non-gifted and 24 from gifted students. In both questions 1 and 2, all 52 responses were correct. These questions were designed in such a way as to build responsdent confidence. In questions 4 and 5 however, there were fewer than 25 correct responses in both cases. When questioned after the test, the children admitted confusion with question 4. They were unsure if they were looking at the crane from a window opposite, or from the ground below. Careful study of the photograph shows, however, that the crane operator's cabin and the cement bucket hanging from the crane provide cues about the relative distance of its various parts that removes any ambiguity about the viewer's position. It should be noted that MacGregor included this question after piloting of the original test.

Category TWO: Perception of Embedded Figures

Table 10

Correct Responses

	Gifted		Non-Gifted	
Question	Grade 5	Grade 6	Grade 5	Grade 6
7	8	13	10	13
8	11	13	13	14
9	11	11	12	12
10	10	13	13	14
11	10	13	12	14
12	11	13	13	13

This category was handled with perfect scoring among the Grade 6 gifted group. This may be attributed to the levels of discrimination reached by the 11 - 12 age group. MacGregor (1975) points out that children find the extraction of embedded figures progressively easier as they increase in age. (p. 72)

Category THREE: Perception of Shape

Table 11

Question	Gifted Grade 5	Gifted Grade 6	Non-Gifted Grade 5	Non-Gifted Grade 6
13	11	12	10	13
14	3	4	8	7
15	4	3	3	2
16	1	3	2	3
17	6	9	1	11
18	3	2	1	4
19	9	11	7	10
20	6	11	6	8
21	9	11	10	12

(Correct Responses)

This category was handled poorly by all groups, with only 20% of correct responses (evenly distributed) in questions 15 (railway carriages), 16 (wagon wheels), and 19 (cliffs). These questions were answered with fewer correct responses than in any other category. The discrimination of figure from ground may have been unusually difficult because of the definition loss in the reproduction of the test booklet. Some clarity may also have been lost in rewording item 15, which dealt with freight cars (or railway carriages).

Category FOUR: Perception of Similarities and Differences

Table 12

Question	Correct Responses: Gifted Grade 5	Gifted Grade 6	Non-Gifted Grade 5	Non-Gifted Grade 6
22	11	13	13	14
23	8	11	11	14
24	9	10	8	9
25	7	8	9	3
26	9	10	12	9
27	2	2	10	10

Question 27 in this category was the most poorly answered question by the gifted group with only 21.5% of correct responses. In consultation with three art specialists and prior to the arrival of a correct answer key, no agreement could be made as to which was the correct response. MacGregor (1975) noted difficulty of separating perceptual and cognitive factors in responses to this category. How one responds seems to depend on the "cognitive set" of the respondent.

Category FIVE: Perception of the Vertical

Table 13

Correct Responses

Question	Gifted Grade 5	Gifted Grade 6	Non-Gifted Grade 5	Non-Gifted Grade 6
28	11	13	11	14
29	11	12	11	11
30	6	5	11	11
31	4	2	10	9
32	9	11	8	7
33	10	8	10	11

Questions 30 (car park) and 31 (frying pan) had fewer than 35% of correct responses. This may be in part attributable to ambiguity within the diagrams drawn for the Australian sample (not the example used in the original MPI) rather than to the lack of discriminating ability among the groups being tested.

Category SIX: Perception Modified by Constancy

Table 14

	Correct Responses			
	Gifted		Non-Gifted	
Question	Grade 5	Grade 6	Grade 5	Grade 6
34	9	13	12	14
35	11	12	12	12
36	11	13	10	13
37	10	13	11	14
38	9	10	8	8
39	9	11	10	11
40	7	11	5	14
41	11	11	11	13
42	9	9	2	10

Grade 5 non-gifted girls seemed to experience unusual difficulty with question 38 (building frames). It was interesting to note that in two separate interviews after the test, two girls remarked that they were unfamiliar with building construction. The familiarity aspect could be a factor, as expected.

Category SEVEN: Perception of Contour

Table 15

	Correct Responses			
	Gifted		Non-Gifted	
Question	Grade 5	Grade 6	Grade 5	Grade 6
43	10	13	10	12
44	11	13	10	12
45	10	11	10	12
46	11	13	11	15
47	11	13	10	14
48	11	12	10	12

Responses to this category were generally correct: no less than 83% for any of the groups. The gifted group responded with only five incorrect answers.

CHAPTER FIVE

SUMMARY, CONCLUSION & RECOMMENDATIONS

Summary

The purpose of this study was to extend knowledge about perceptual ability in children identified as gifted. The justification for the research has been based on the following three propositions:

1) There has for many years been a controversy among researchers on whether a relationship exists between the creative and intellectual ability of gifted and non-gifted children.

2) Perception in recent educational literature has been identified as a factor in increased organizational and problem-solving abilities.

3) Literature suggests those with high perceptual levels also tend to display high intellectual abilities.

The review of the literature touched on the problems involved in defining the gifted; on education for the gifted; on defining perception together with a brief historical coverage of its development; and on tests and measures that aid in identifying children in both areas.

Samples for this study were drawn from the population of grade 5and 6 students from Canberra Primary Schools. The instrument used in this study was the MacGregor Perceptual Index. The instrument was administered over a period of two days at each school within the month of April, to a Grade 5 and a Grade 6 sample of gifted students, and to a Grade 5 and a Grade 6 sample of non-gifted students. Results were analysed using the Mann-Whitney U test of significance to determine if any significant differences existed within the ranks of the two groups tested.

Findings and Conclusion

The research hypothesis was validated and thereby answered two questions regarding correlations of giftedness with perceptual ability. The answers are that:

1) There was a statistically significant difference between the overall scores of gifted and non-gifted individuals at the Grade 5 level on the MacGregor Perceptual Index Test.

2) There was a statistically significant difference between the overall scores of gifted and non-gifted individuals at the Grade 6 level on the MacGregor Perceptual Index Test.

Statistically significant differences were obtained between the Grade 5 gifted sample and the Grade 5 non-gifted sample on four of the seven categories that make up the MPI. These were perception of shape, perception of the vertical, perception modified by constancy and perception of contour.

Certain questions were constantly answered incorrectly, while others were constantly answered correctly, indicating a crude measure of face validity for the MPI.

During an interview with the teachers at the Lyons Primary School, it was drawn to my attention that those children who performed above the average on the MPI were also those children who had achieved high academic standing within their grades.

The researcher noted that the time taken to respond to individual questions on the MPI by the gifted group was consistently shorter than that taken by the non-gifted group. It may be that gifted children were more able to rapidly process information or respond more rapidly to perceptual information.

The study has shown that giftedness appears to include superior ability to handle perceptual data. Yet education for the gifted does not appear to emphasize or even encourage experience in the visual art field. Educational planners and administrators may well find that the elaboration of existing programs for the gifted to include perceptually-based learning experiences will bring about enhanced performance by a group already identified as unusually competent in the academic sense.

Recommendations

There is extensive current research on education for the gifted, and an equal body of research on perception especially related to the visual field. However, there is a lack of research relating to visual perception which correlates with that on gifted children. With this observation, and the results of this study in mind, the following recommendations are made:

1) Studies should be conducted to determine in specific terms the relationship between giftedness and perceptual acuity.

2) Teacher training should emphasise various needs and behaviours of minority populations that are evident within the average classroom, and should include

experiences in developing non-verbal ways to promote the education of these minorities.

3) Research should be undertaken to develop further non-verbal perception tests, to cover a wider range of areas, and to make cross-validation easier.

4) A study should be conducted among gifted and non-gifted groups using a different non-verbal perception test, to determine whether the results of this study can be replicated.

5) It is further recommended that a correlation study be developed to determine whether or not high scorers of the MPI are also those children identified as gifted or talented in art. (i.e. whether or not perception is related to artistic talent.)

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APPENDIX A

Calculation for Tables 1-8

MPI Raw Score Totals

Group A

$$U = \frac{n_1n_2+n_1(n_2+1)}{2} - R$$

$$= (11)(13) + \frac{(11)(14)}{2} - 79.5$$

$$= 143 + 77 - 79.5$$

$$= 140.5$$

Group B

$$U_1 = n_1n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

$$= (11)(13) + \frac{(13)(14)}{2} - 220.5$$

$$= 143 + 91 - 220.5$$

$$= 13.5^*$$

Group C

$$U = n_1n_2 + \frac{n_1(n_2+1)}{2} - R_1$$

$$= (13)(15) + \frac{(13)(16)}{2} - 142$$

$$= 195 + 104 - 142$$

$$= 157$$

Group D

$$U_1 = n_1n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

$$= (13)(15) + \frac{(15)(16)}{2} - 264$$

$$= 195 \pm 120 - 264$$

$$= 51^*$$

* $p < .05$

Perception of Distance

Group A $U = n_1 n_2 + \frac{n_1(n_2+1)}{2} - R_1$

$= 11.13 + \frac{11(14)}{2} - 120.5$

$= 143 + 77 - 120.5$

$= 99.5$

Group B $U_1 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2$

$= (11)(13) + (13)(14) - 179.5$

$= 143 + 91 - 179.5$

$= 54.5$

Group C $U = n_1 n_2 + \frac{n_1(n_2+1)}{2} - R_1$

$= 13.15 + 13.16 - 201.5$

$= 195 + 104 - 201.5$

$= 97.5$

Group D $U_1 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2$

$= 13.15 + \frac{15.16}{2} - 204.5$

$= 195 + 120 - 204.5$

110.5

Perception of Embedded Figures

Group A

$$U = n_1 n_2 + \frac{n_1(n_2+1)}{2} - R_1$$

$$= 11.13 + \frac{11(14)}{2} - 147.5$$

$$= 143 + 77 - 147.5$$

$$= 72.5$$

Group B

$$U_1 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

$$= 11.13 + \frac{13(14)}{2} - 152.5$$

$$= 143 + 91 - 152.5$$

$$= 81.5$$

Group C

$$U = n_1 n_2 + \frac{n_1(n_2+1)}{2} - R_1$$

$$= 13.15 + \frac{13.16}{2} - 162.5$$

$$= 195 + 104 - 162.5$$

$$= 136.5$$

Group D

$$U_1 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

$$= 13.15 + \frac{15.16}{2} - 243.5$$

$$= 195 + 120 - 243.5$$

$$= 71.5$$

Perception of Shape

Group A

$$U = n_1 n_2 + \frac{n_1(n_2+1)}{2} - R_1$$

$$= 11.13 + \frac{11.14}{2} - 102.5$$

$$= 143 + 77 - 102.5$$

$$= 117.5$$

Group B

$$U_1 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

$$= 11.13 + \frac{13.14}{2} - 197.5$$

$$= 143 + 91 - 197.5$$

$$= 36.5^*$$

Group C

$$U = n_1 n_2 + \frac{n_1(n_2+1)}{2} - R_1$$

$$= 13.15 + \frac{13.16}{2} - 114.5$$

$$= 195 + 104 - 114.5$$

$$= 184.5$$

Group D

$$U_1 = n_1 n_2 + n_2(n_2+1) - R_2$$

$$= 13.15 + \frac{15.16}{2} - 220.5$$

$$= 195 + 120 - 220.5$$

$$= 94.5$$

* $p < .05$

<u>Perception of Similarities and Differences</u>

Group A

$$U = n_1 n_2 + \frac{n_1(n_2+1)}{2} - R_1$$

$$= 11.13 + \frac{11.14}{2} - 105$$

$$= 143 + 77 - 150$$

$$= 70$$

Group B

$$U_1 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

$$= 11.13 + \frac{13.14}{2} - 150$$

$$= 143 + 91 - 150$$

$$= 84$$

Group C

$$U = n_1 n_2 + \frac{n_1(n_2+1)}{2} - R_1$$

$$= 13.15 + \frac{13.16}{2} - R_1$$

$$= 195 + 104 - 156$$

$$= 143$$

Group D

$$U_1 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

$$= 13.15 + \frac{15.16}{2} - 250$$

$$= 195 + 120 - 250$$

$$= 65$$

Perception of the Vertical

Group A

$$U = n_1 n_2 + n_1(n_2+1) - R_1$$

$$= 11.13 + \frac{11.14}{2} - 104$$

$$= 143 + 77 - 104$$

$$= 116$$

Group B

$$U_1 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

$$= 11.13 + \frac{13.14}{2} - 196$$

$$= 143 + 91 - 196$$

$$= 38^*$$

Group C

$$U = n_1 n_2 + \frac{n_1(n_2+1)}{2} - R_1$$

$$= 13.15 + \frac{13.16}{2} - 165$$

$$= 195 + 104 - 165$$

$$= 134$$

Group D

$$U_1 = n_1 n_2 + n_2(n_2+1) - R_2$$

$$= 13.15 + \frac{15.16}{2} - 241$$

$$= 195 + 120 - 241$$

$$= 74$$

* $p < .05$

Perception Modified by Constancy

Group A

$$U = n_1n_2 + \frac{n_1(n_2+1)}{2} - R_1$$

$$= 11.13 + \frac{11.14}{2} - 84.5$$

$$= 143 + 77 - 84.5$$

$$= 135.5$$

Group B

$$U_1 = n_1n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

$$= 11.13 + \frac{13.14}{2} - 215.5$$

$$= 143 + 91 - 215.5$$

$$= 18.5^*$$

Group C

$$U = n_1n_2 + \frac{n_1(n_2+1)}{2} - R_1$$

$$= 13.15 + \frac{13.16}{2} - 167$$

$$= 195 + 104 - 167$$

$$= 132$$

Group D

$$U_1 = n_1n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

$$= 13.15 + \frac{15.16}{2} - 239$$

$$= 195 + 120 - 239$$

$$= 76$$

* $p < .05$

Perception of Contour

Group A

$$U = n_1 n_2 + \frac{n_1(n_2+1)}{2} - R_1$$

$$= 11.13 + \frac{11.14}{2} - 100.5$$

$$= 143 + 77 - 100.5$$

$$= 119.5$$

Group B

$$U_1 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

$$= 11.13 + \frac{13.14}{2} - 195$$

$$= 143 + 91 - 195$$

$$= 39^*$$

Group C

$$U = n_1 n_2 + \frac{n_1(n_2+1)}{2} - R_1$$

$$= 13.15 + \frac{13.16}{2} - 157$$

$$= 195 + 104 - 157$$

$$= 142$$

Group D

$$U_1 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

$$= 13.15 + \frac{15.16}{2} - 251$$

$$= 195 + 120 - 251$$

$$= 64$$

* $p < .05$

APPENDIX B

The MacGregor Perceptual Index Test

INSTRUCTIONS FOR ADMINISTERING THE PERCEPTUAL INDEX

Each student requires a copy of the Test Booklet, a set of Answer Sheets (numbered ONE through ~~NINE~~)11, and a pencil. When these have been passed out, the teacher addresses the students as follows:

The booklets which you have in front of you have photographs in them which you will be looking at in a few minutes. I have some questions about them which I would like you to answer on the Answer Sheets.

Usually, you will have ten seconds to answer each question. At the end of ten seconds, I shall say "Stop. Let's go on to the next question." Use your pencils to answer each question: you are required only to make check marks. You may erase your answer and put in another if you change your mind.

Ten seconds is quite a long time. Study each photograph carefully before answering: don't guess wildly. If you miss one question, don't stop to think it out. It's more important to keep up with me as I go over the next question with you.

Ready? Then look at Answer Sheet ONE. ~~In the spaces~~ In the top right-hand corner, ~~fill~~ write in your name, the grade you are in, how old you are; draw a circle around "Boy" if you are a boy, and around "Girl" if you are a girl.

Now open your Test Booklets at page 1. I want you to think of this photograph as if it was a scene that you were looking at through a window. When you look at things through a window you can tell that some of the things you are seeing are quite near or close to you and some things are far away. For example, in the photograph on page 1 you can see a girl, marked X, and a house, marked Y. Which looks nearer to you: the girl marked X or the house marked Y?

Now look at Question 1 on your Answer Sheet. You can see that you have three choices in answering. The first says: The part marked X (that is, the girl) looks nearer (to me) than the part marked Y (that is, the house). There is a little square beside that sentence. If you think that is the best of the three choices, you would put a check mark in that square.

The second says: The part marked Y looks nearer to me than the part marked X. If you think that is the best choice, you would put a check mark in that square.

The third says: The part marked X and the part marked Y look the same distance away from me. If you think that is the best of the three choices, you would put a check mark in that square. *(The teacher may clarify as necessary).*

You have <u>three</u> choices: make <u>one</u> check mark with your pencils, in ten seconds, starting NOW.

At the end of ten seconds, the teacher says:

Stop.

The next five questions are going to ask for the same choices: Does the part marked X look nearer than the part marked Y? Does the part marked Y look nearer than the part marked X? Do parts X and Y look the same distance away? We'll do them one at a time. Turn to page 2 in your Test Booklets and look at photograph 2 (the Ferris wheel). On your Answer Sheet, where it says Question 2, put a check mark in the little square beside the choice you make, in ten seconds, starting NOW.

Stop.

block of flats

Now photograph 3 (~~the apartment blocks~~). Answer Question 3 by checking the square of your choice in ten seconds starting NOW.

Stop.

Now turn to page 3 of your Test Booklet.

Now photograph 4 (the crane). Answer Question 4 by checking the square of your choice in ten seconds startingNOW.

Stop.

Turn to ~~page~~ answer sheet Two.

Now photograph 5 (the street light). Answer Question 5 by checking the square of your choice in ten seconds starting NOW.

Stop.

Now photograph 6 (the conveyer belts). Answer Question 6 by checking the square of your choice in ten seconds starting NOW.

Stop.

Now we have another kind of problem for you to solve. Look at Answer Sheet TWO. You will see that some shapes have been drawn on it, with a line beside each shape. In a few moments I'm going to ask you to turn the page of your Test Booklets, on the next two pages ~~and when you do~~ you'll see six photographs, numbered 7 through 12. Each photograph has one of the shapes on Answer Sheet TWO somewhere in it. You are to write the number of the photograph where you find the shape on the line beside the shape. Suppose you discover that the first shape on your answer sheet can be found in photograph 9. You would write 9 on the line beside the first shape.

The teacher demonstrates until all the children seem to understand what is required.

Each shape is used only once, so you should use every number between 7 and 12. All the shapes on the Answer Sheet are about the same size as they are in the photographs. This time, instead of stopping you after 10 seconds, we'll add all the times together to give us 60 seconds. You have 60 seconds to answer all of Answer Sheet TWO, so turn to pages 4 and 5 of the Test Booklet and begin NOW.

Stop.

Now turn to answer sheet THREE.

~~Now~~ We'll move to the next set of problems. Look at photograph 13 on page 7 of your Test Booklet, and then at Question 13 on Answer Sheet THREE. The question says: How many people do you see in this photograph? When you know the answer, you make a check mark in the numbered square. So if you see two people in this photograph, you would make a check mark in the square with 2 printed in it.

Sometimes you will see only part of the object. Count the part as one; but remember that two parts of the same thing don't count as two. Since they are parts of the same thing, you would only count one.

We will do these one at a time, taking ten seconds to answer each question. Turn the page on your Test Booklet to page 8, look at photograph 14, and check how many leaves you see, in ten seconds starting NOW.

Stop.

Now Question 15. How many ~~freight cars~~ train carriages do you see, in 10 seconds starting NOW.

Stop.

Now Question 16. How many wagon wheels do you see, in 10 seconds starting NOW.

Stop.

Now Question 17. How many children do you see, in 10 seconds starting NOW.

Stop.

~~Turn to Answer Sheet FOUR, and to page 11 in your Test Booklet.~~ 3 Still on answer sheet THREE. ~~You~~ You will see a photograph of a fence, with a black patch covering part of it. Question 18 on Answer Sheet ~~FOUR~~ 3 shows three drawings, and you are asked to choose which of the three drawings looks most like the way things would look under the black patch in photograph 18. If you decide that drawing A looks most like the way things would look under the black patch, you would make a check mark in the little square marked A. If you decided the best answer was B, you'd check the B square, and so on. Make your check mark in square A, B, or C now.

We are going to add together the times for questions 19, 20, and 21, so that you have 30 seconds to do all three. Turn the page in your Test Booklets to page ~~12~~ 10 and begin NOW.

Stop.

The next questions are about how one thing looks like another. Sometimes two things look exactly the same. At other times you can make the best choice from a lot of things that are really all a little different. If I say: Who is Joe like in this class? You might answer that he isn't exactly like anybody else, but he looks more like Bill than any of the others because they are about the same height and have the same colour of hair. You'd have made your choice by deciding that Bill has more features that look like Joe's features than anybody else in the class.

The teacher may clarify as necessary. It is important that the childrrn realize that they should look for as many points of similarity as possible in making a choice.

Look at photograph 22, on page ~~13~~ 11 of your Test Booklets. There are four cogs ~~gear wheels~~, marked A, B, C, and D. I am going to ask which other ~~gear wheel~~ cog A looks most like: or do they all look exactly the same? Now look at Question 22, on Answer Sheet ~~five~~. 4 You have four choices: A looks most like B; A looks most like C; A looks most like D; they all look exactly the same. You would put a check mark in the square beside the best answer. Take 10 seconds to do that, starting NOW.

Now we'll try the next one: Look at Question 23, on the Answer Sheet. 4 Your choices are A and B; A and C; B and C; and All the Same. Turn the page to page ~~14~~ 12 of your Test Booklets and answer Question 23 (Grain elevators) grain silos in ten seconds, starting NOW.

Stop.

Now Question 24 (Knives) in ten sconds, starting NOW.

Stop.

Now Question 25 (Spoons) in ten seconds, starting NOW.

Stop.

Now Question 26 (Gloves) in ten seconds, starting NOW.

Stop.

Turn to page ~~16~~ 14 in your Test Booklets. Now do Question 27 (Fire hydrants) in ten seconds, starting NOW.

Stop.

Now look at page ~~17~~ 15 in your Test Booklets. Photograph 28 was produced by beginning with a normal photograph (First stage) tilting it (Second stage) and cutting its edges (Third stage). Look at Question 28 on Answer Sheet SIX. You are asked to decide which of th three drawings, A, B or C, is most like the way photograph 28 (Third stage) was before it was tilted and cut. This is very easy, because we have the first stage at the top of page ~~17~~ 15, and we can see that drawing **B** is most like it. So we would make a check mark in the little square marked **B** in Question 28.

The others are not so easy, because all you will have is the tilted and cut photograph (like photograph 28: Third Stage). You will have to decide which of the three drawings, A, B or C, is most like the way each photograph was before it was tilted and cut. *(The teacher may pause at this point and check to see that every one seems to understand what is required.)* We will add all our ten seconds together this time, so that you have 50 seconds to answer Questions 29 through 33. Turn the page of your Test Booklets to pages ~~18~~ 16 and ~~19~~ 17 and begin NOW.

Stop.

These next questions are about the way things look and the way things really are. Suppose you see your friend at the end of a long street. How does he look - very small? But has he really grown very small? Or is he really the same size as he always was, but just looks small because he is far away? Look at photograph 34, on page 18 ~~21~~ of your Test Booklets. There are some street lights, marked A, B, C, and D. Now look at Question 34, on Answer Sheet ~~SEVEN~~ 8. The question asks: Are the streetlights A, B, C and D really the same height? If you think they are, check the square marked YES. If you think they are not, check the square marked NO. Remember to think about the difference between the way things look, and the way things really are. 10 secs

Now turn the page in your test booklets to page ~~22~~ 19. Question 35 asks: Is boy B really taller than Boy A? Answer YES or NO in ten seconds, starting NOW.

Stop.

Question 36. Are bowls A, B, C and D really the same size? Yes or No in ten seconds, starting NOW.

Stop.

Question 37. Is side A of the board really further away from you than side B? Yes or No in ten seconds, starting NOW.

Stop.

Question 38. Is it really the same distance between posts A and B, B and C, C and D, D and E, E and F, and F and G? Yes or No in ten seconds, starting NOW.

Stop.

Now turn to page ~~25~~ 21 in your Test Booklets. On this page there are three photographs of clocks. Now look at Question 39 on Answer Sheet ~~EIGHT.~~ 9 The question gives you some choices, and you have to decide which is the best choice. The first is that all three photographs are of the same clock. The second is that photographs B and C are of the same clock, but A is of a different clock. The third is that photographs A and C are of the same clock, but B is of a different clock. The fourth choice is that A and B are of the same clock, but C is of a different clock. And the last choice is that all three photographs are of different clocks. Your choices again are: All same, A different, B different, C different, all different. Make a check mark in the square beside the best choice, in ten seconds, starting NOW.

For Question 40, the choices are the same. Turn to page ~~26~~ 22 in your Test Booklets, look at the photographs of the seats and do question 40 in ten seconds, starting NOW.

Stop.

Question 41, the irons. Same choices, in ten seconds, starting NOW.

Stop.

Turn to page ~~28~~ 24 in your Test Booklets, and answer question 42 (aircraft). Same choices, in ten seconds, starting NOW.

Stop.

Now look at Answer Sheet ~~NINE~~ 11. There are some shapes drawn on it, and each one has a line beside it. When I tell you, you will turn the page of your Test Booklet to pages ~~30~~ 25 and ~~31~~ 26 and see six photographs numbered 43 ~~through~~ to 48. In each photograph there is an object that has an outline like one of these shapes on Answer Sheet ~~NINE~~ 11, and I want you to write the number of the photograph where the ouline can be found on the line beside the shape. So if you were to find the first outline in photograph 48, you would write 48 on the line beside it. The shapes on the Answer Sheet may not be the same size as in the photograph, and some of them may have been turned upside down or sideways. Each shape has been used only once, so you should have used every number from 43 ~~through~~ to 48 when you have completed all six items.

We'll add together the times for all six items, so that you have 60 seconds to answer the whole page, starting NOW.

Stop.

Close your books.

Answer Sheet ONE

Question 1

Part X looks nearer than part Y ☐
Part Y looks nearer than part X ☐
Part X and part Y look the same distance away ☐

Question 2

Part X looks nearer than part Y ☐
Part Y looks nearer than part X ☐
Part X and part Y look the same distance away ☐

Question 3

Part X looks nearer than part Y ☐
Part Y looks nearer than part X ☐
Part X and part Y look the same distance away ☐

Question 4

Part X looks nearer than part Y ☐
Part Y looks nearer than part X ☐
Part X and part Y look the same distance away ☐

Qestion 5

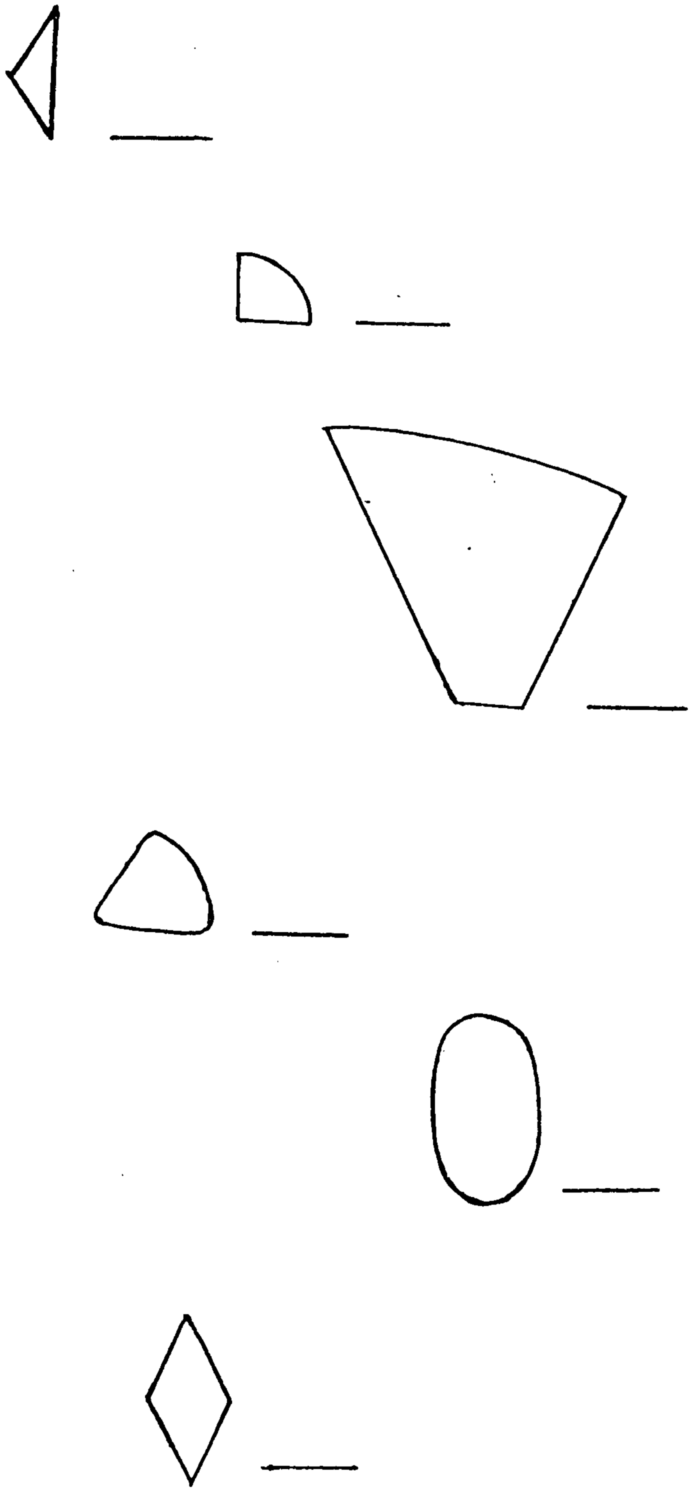
Part X looks nearer than part Y ☐
Part Y looks nearer than part X ☐
Part X and part Y look the same distance away ☐

Question 6

Part X looks nearer than part Y ☐
Part Y looks nearer than part X ☐
Part X and part Y look the same distance away ☐

Answer Sheet TWO

Questions 7 / 12



Question 13

How many people do you see in this photograph

1	2	3	4	5	6

Question 14

How many leaves do you see in this photograph

1	2	3	4	5	6

Question 15

How many ~~freight~~ railroad cars do you see in this photograph

1	2	3	4	5	6

Question 16

How many wagon wheels do you see in this photograph

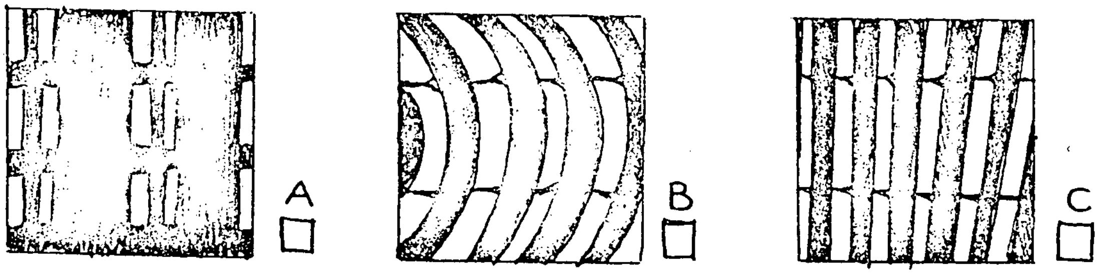
1	2	3	4	5	6

Question 17

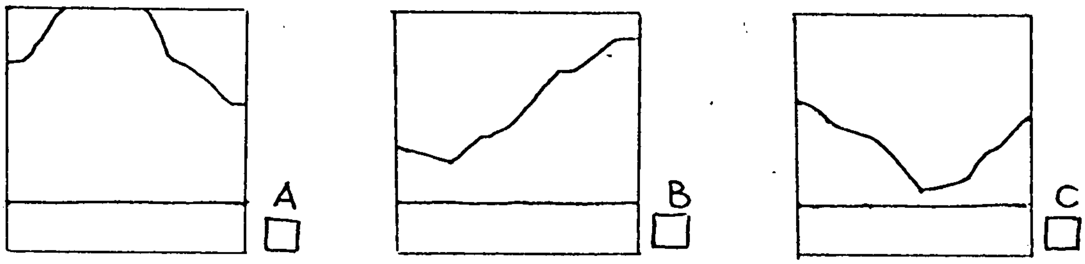
How many children do you see in this photograph

1	2	3	4	5	6

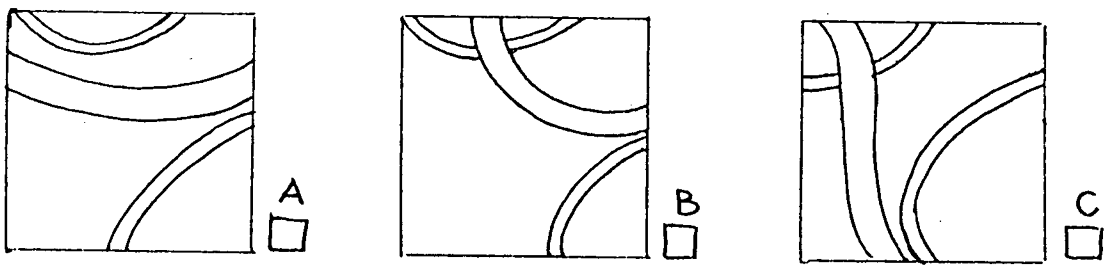
Question 18



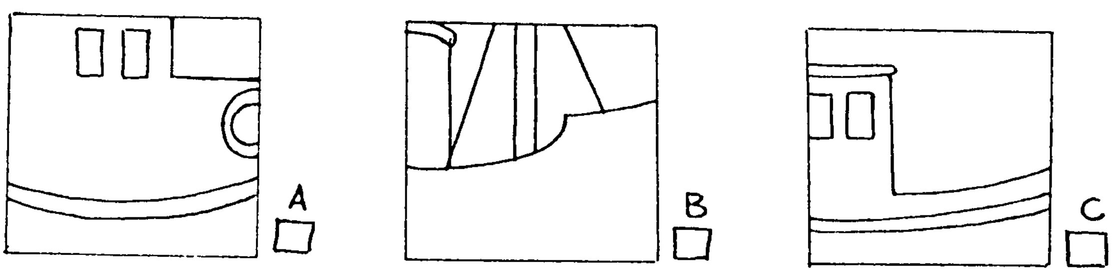
Question 19



Question 20



Question 21



Question 22 (Gear wheels)

A looks most like B ☐
A looks most like C ☐
A looks most like D ☐
They all look exactly alike ☐

Question 23 (Grain elevators)

A looks most like B ☐
A looks most like C ☐
B looks most like C ☐
They all look exactly alike ☐

Question 24 (Knives)

A looks most like B ☐
A looks most like C ☐
B looks most like C ☐
They all look exactly alike ☐

Question 25 (Spoons)

B looks most like A ☐
B looks most like D ☐
B looks most like E ☐
They all look exactly alike ☐

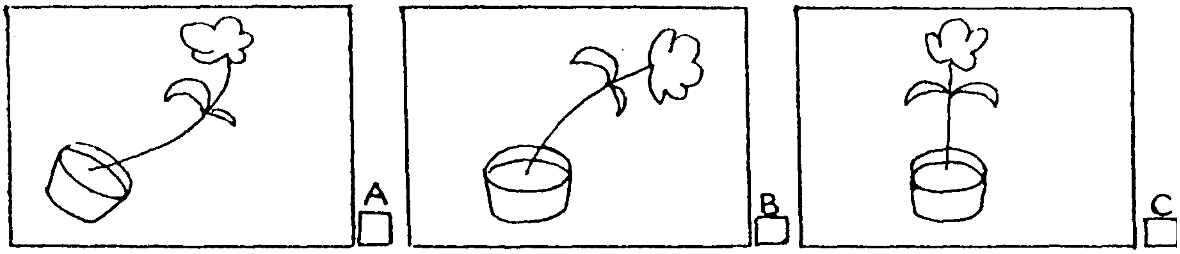
Question 26 (Gloves)

A looks most like B ☐
A looks most like C ☐
A looks most like D ☐
They all look exactly alike ☐

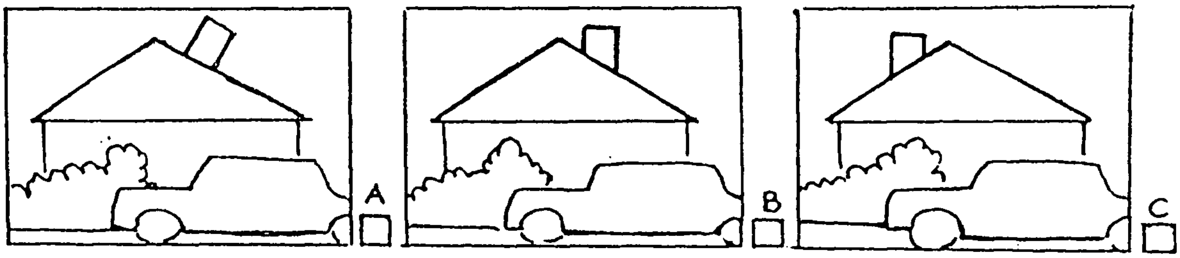
Question 27 (Fire hydrants)

A looks most like B ☐
A looks most like C ☐
B looks most like C ☐
They all look exactly alike ☐

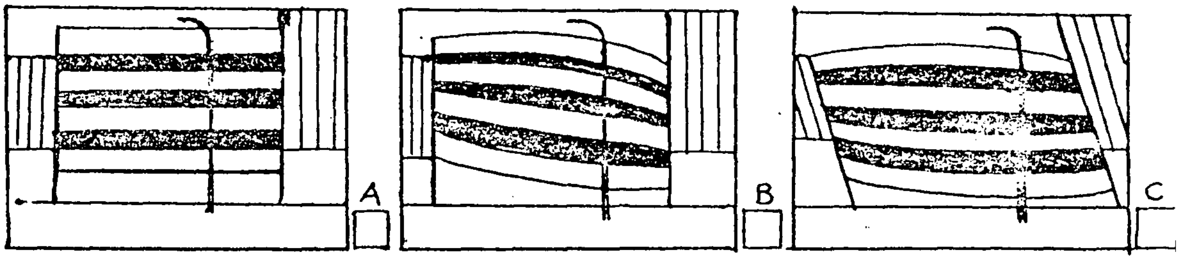
Question 28



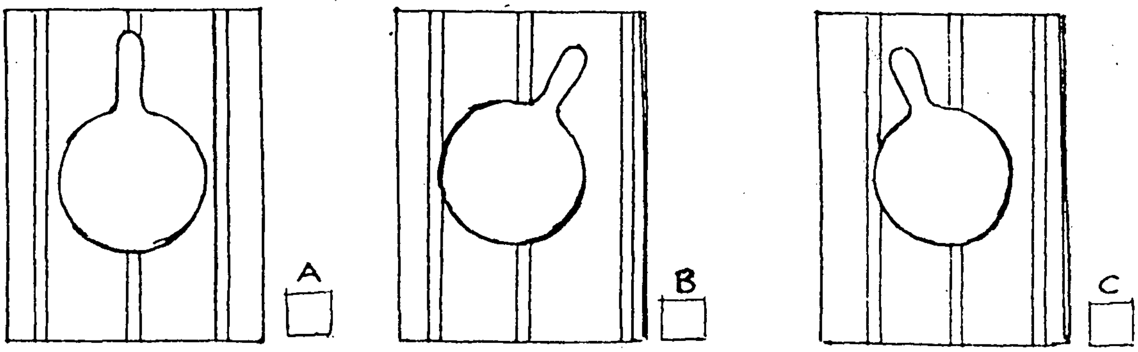
Question 29



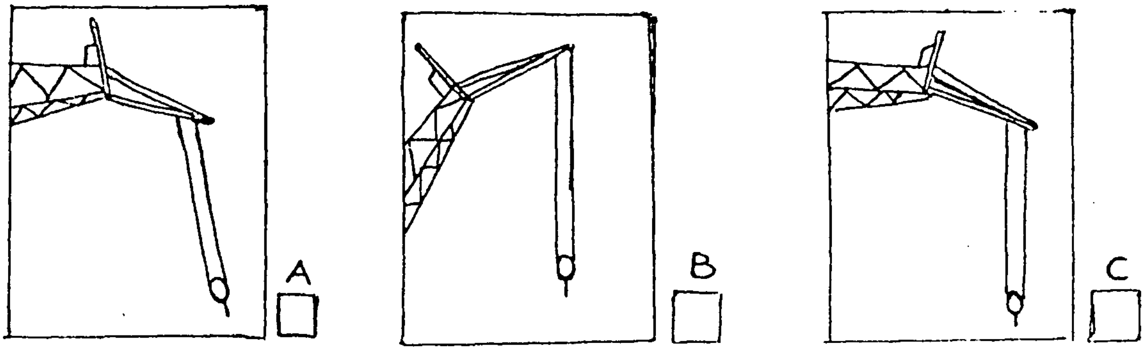
Question 30



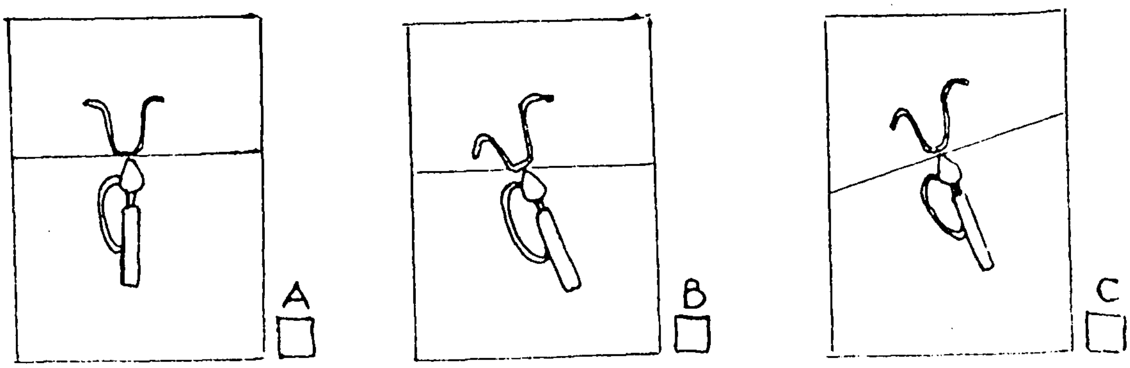
Question 31



Question 32



Question 33



Question 34

Are the streetlights ABC and D really the same height

Yes ☐

No ☐

Question 35

Is boy B really taller than boy A

Yes ☐

No ☐

Question 36

Are bowls ABC and D really the same size

Yes ☐

No ☐

Question 37

Is side A of the board really further away from you than side B

Yes ☐

No ☐

Question 38

Is it really the same distance between posts A and B, B and C, C and D, D and E, E and F and F and G

Yes ☐

No ☐

Question 39

Photographs A, B, and C are all of the same clock ☐
Photograph A is of a different clock ☐
Photograph B is of a different clock ☐
Photograph C is of a different clock ☐
Photographs A, B and C are all of different clocks ☐

Question 40

Photographs A, B and C are all of the same seat ☐
Photograph A is of a different seat ☐
Photograph B is of a different seat ☐
Photograph C is of a different seat ☐
Photographs A, B and C are all of different seats ☐

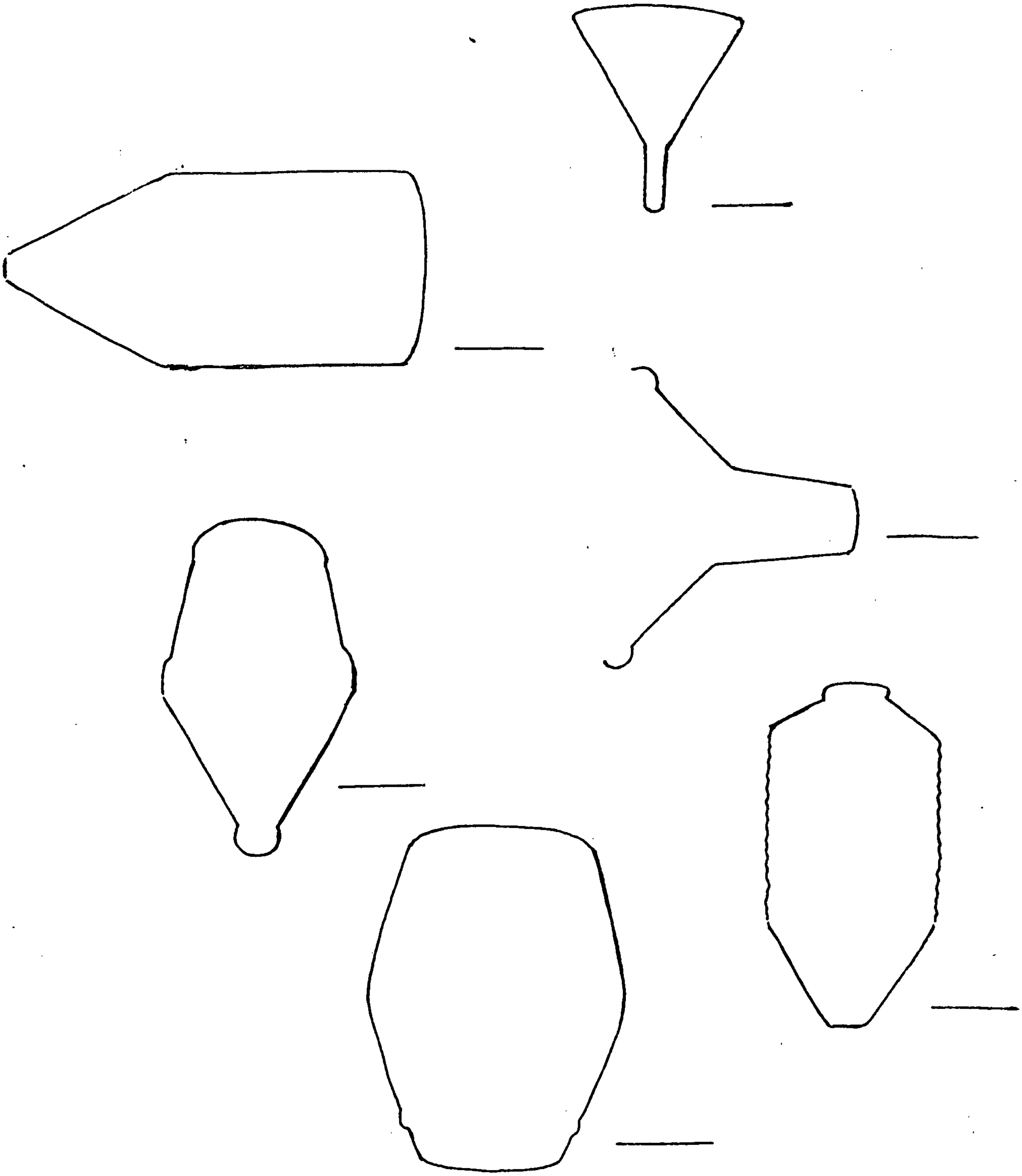
Question 41

Photographs A, B and C are all of the same iron ☐
Photograph A is of a different iron ☐
Photograph B is of a different iron ☐
Ph o tograph C is of a different iron ☐
Photograph A, B and C are all of different irons ☐

Question 42

Photographs A, B and C are all of the same aircraft ☐
Photograph A is of a different aircraft ☐
Photograph B is of a different aircraft ☐
Photograph C is of a different aircraft ☐
Photograph A, B and C are all of different aircraft ☐

Questions 43 / 49



MPI (Amended version, Collier)

Answer Sheet ONE

Category ONE: Perception of Distance

Question 1

The girl X looks nearer than the house Y ☐

The house Y looks nearer than the girl X ☐

The girl X and the house Y look to be the same distance away ☐

Question 2

The part X looks nearest to me ☐

The part Y looks nearest to me ☐

The part Z looks nearest to me ☐

Question 3

The part X looks nearer than the part Y ☐

The part Y looks nearer than the part X ☐

The part X and the part Y look to be the same distance away from me ☐

Question 4

The part X looks nearer than the part Y ☐

The part Y looks nearer than the part X ☐

The part X and the Part Y look to be the same distance away ☐

Answer Sheet TWO

Question 5

The part X looks nearer than the part Y ☐

The part Y looks nearer than the part X ☐

The part X and the part Y look to be the same distance away ☐

Question 6

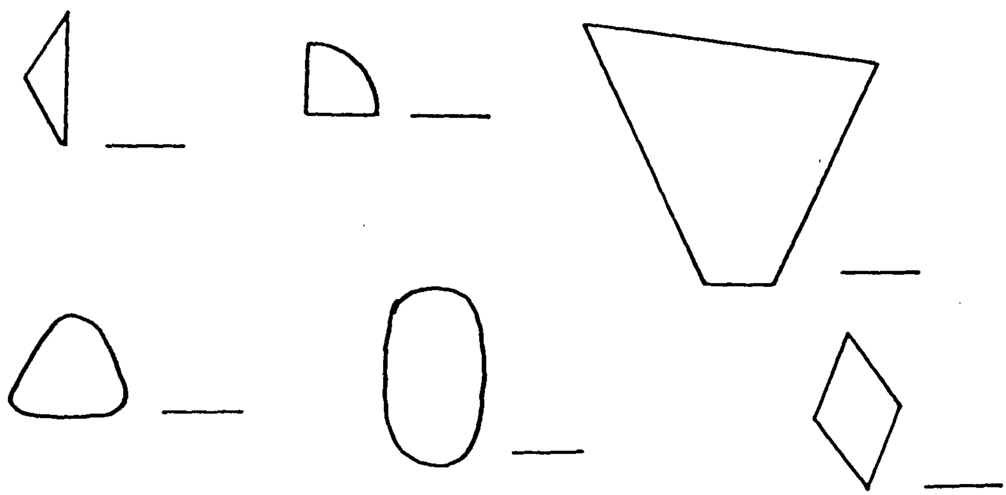
The part X looks nearer than the part Y ☐

The part Y looks nearer than the part X ☐

The part X and the part Y look to be the same distance away ☐

Category TWO: Perception of Embedded Figures

Questions 7 - 12



Answer Sheet THREE

Category THREE: Perception of Shape

Question 13

How many people (or parts of people) do you see?

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

Question 14

How many leaves (or parts of leaves) do you see?

3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐

Question 15

How many train carriages (or parts of train carriages) do you see?

3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐

Question 16

How many wagon wheels (or parts of wagon wheels) do you see?

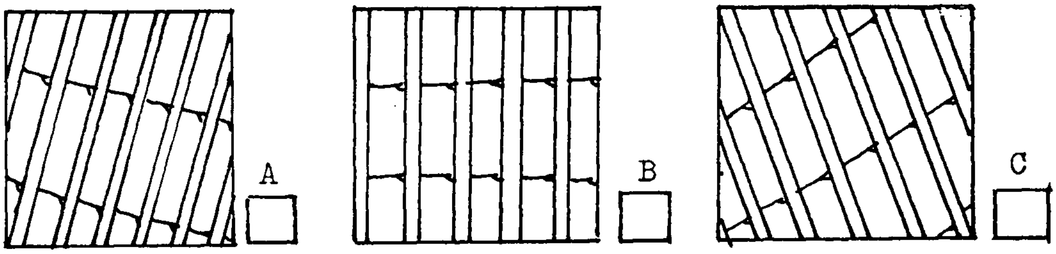
3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐

Question 17

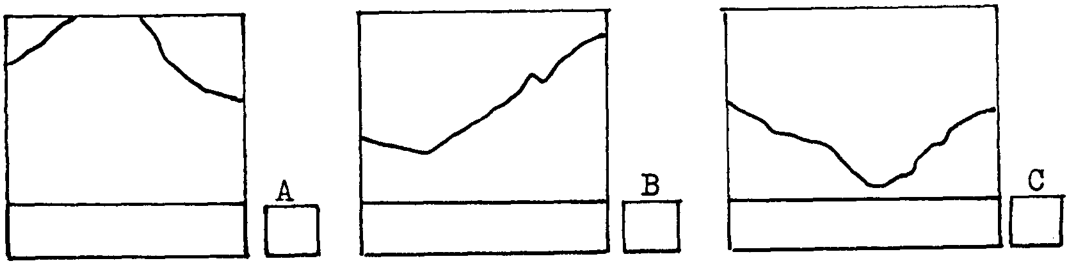
How many children (or parts of children) do you see?

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

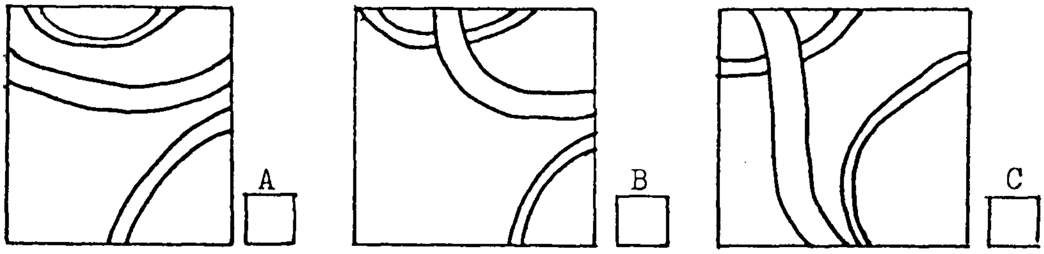
Question 18



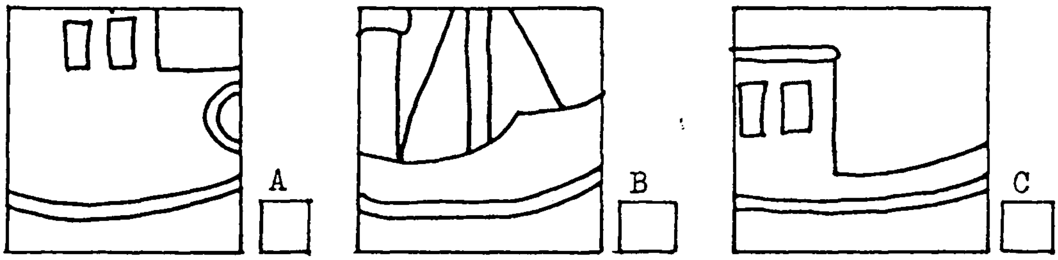
Question 19



Question 20



Question 21



Category FOUR: Perception of Similarities and Differences

Question 22

Gear A and gear B look most alike ☐

Gear A and gear C look most alike ☐

Gear A and gear D look most alike ☐

They all look exactly alike ☐

Question 23

Grain silo A and grain silo B look most alike ☐

Grain silo A and grain silo C look most alike ☐

Grain silo B and grain silo C look most alike ☐

They all look exactly alike ☐

Answer Sheet FIVE

Question 24

- Knife C and knife B look most alike ☐
- Knife C and knife A look most alike ☐
- Knife A and knife B look most alike ☐
- They all look <u>exactly</u> alike ☐

Question 25

- Spoon C and spoon A look most alike ☐
- Spoon C and spoon B look most alike ☐
- Spoon C and spoon D look most alike ☐
- Spoon C and spoon E look most alike ☐
- They all look <u>exactly</u> alike ☐

Question 26

- Glove A and Glove B look most alike ☐
- Glove A and glove C look most alike ☐
- Glove A and glove D look most alike ☐
- They all look <u>exactly</u> alike ☐

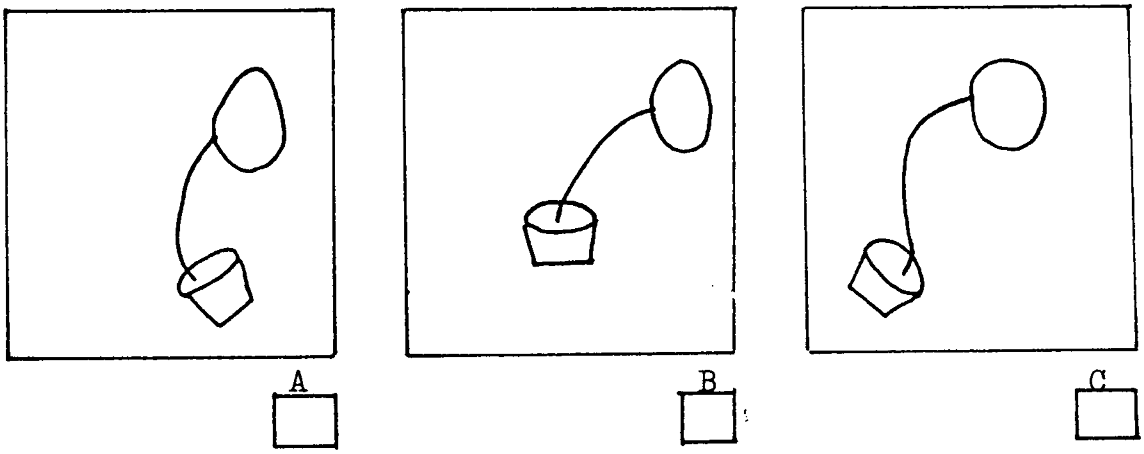
Question 27

- Fire hydrant A and Fire hydrant B look most alike ☐
- Fire hydrant A and Fire hydrant C look most alike ☐
- Fire hydrant B and Fire hydrant C look most alike ☐
- They all look <u>exactly</u> alike ☐

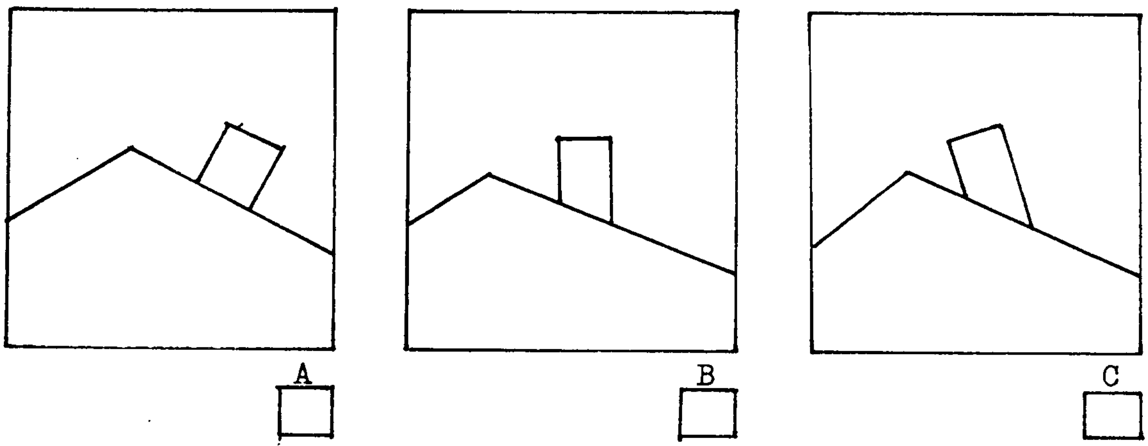
Answer Sheet SIX

Category FIVE: Perception of the Vertical

Question 28

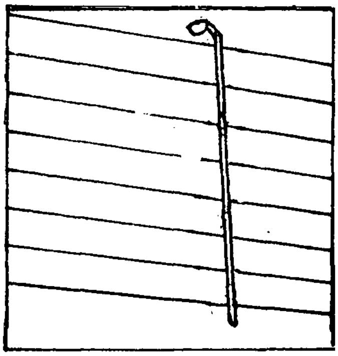


Question 29

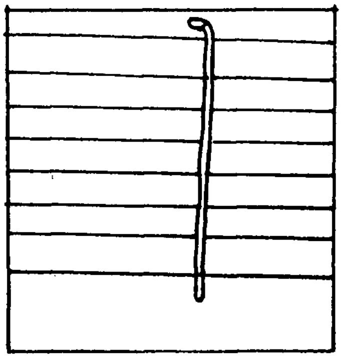


Answer Sheet SEVEN

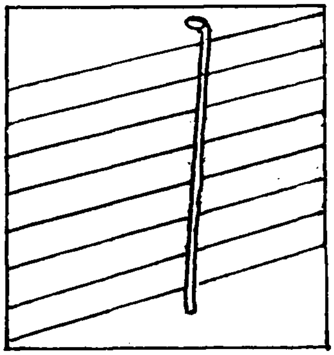
Question 30



A

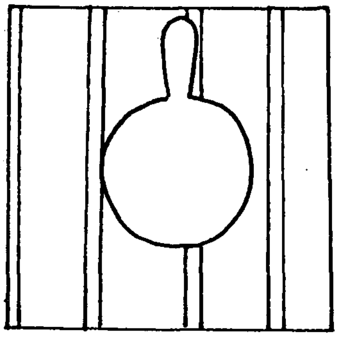


B

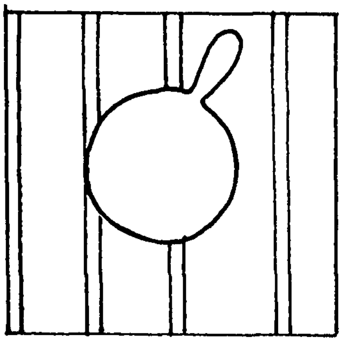


C

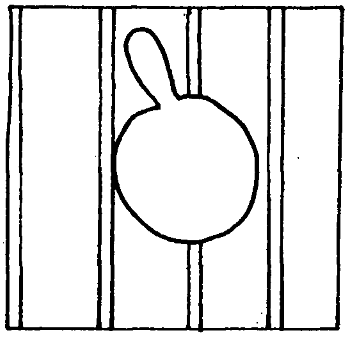
Question 31



A

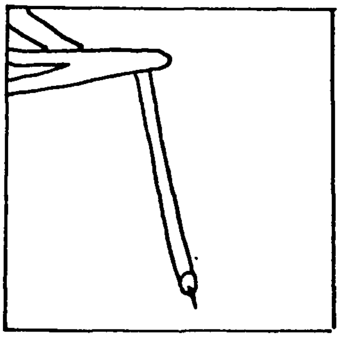


B

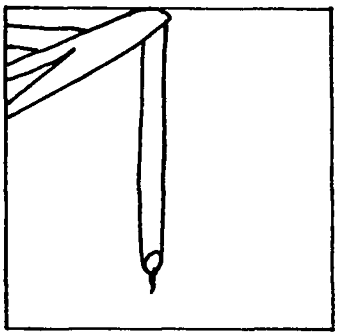


C

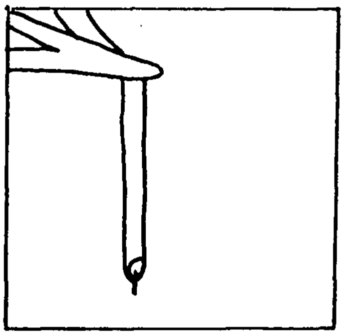
Question 32



A



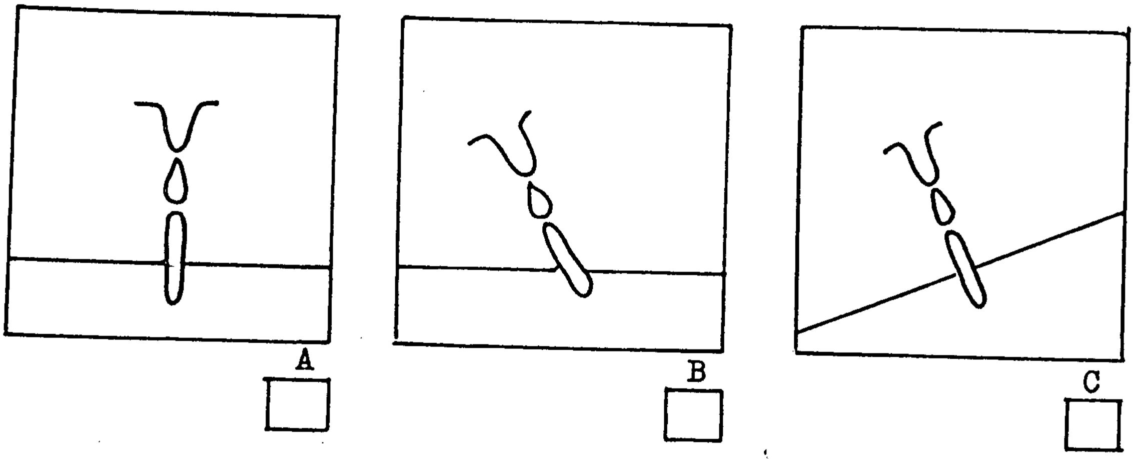
B



C

Answer Sheet EIGHT

Question 33



Category SIX: Perception Modified by Constancy

Question 34

Are the street lights A,B,C & D _really_ the same height?

Yes ☐

No ☐

Question 35

Is boy B _really_ taller than Boy A?

Yes ☐

No ☐

Question 36

Are bowls A,B,C & D _really_ the same size.?

Yes ☐

No ☐

Answer Sheet NINE

Question 37

Is side A of the board really further away from you than Side B?

Yes ☐

No ☐

Question 38

Is it really the same distance between posts A & B, B & C, C & D, D & E, E & F, and F & G?

Yes ☐

No ☐

Question 39

Photographs A, B and C are all of the same clock ☐

Photograph A is of a different clock ☐

Photograph B is of a different clock ☐

Photograph C is of a different clock ☐

Photographs A,B and C are all of different clocks ☐

Answer Sheet TEN

Question 40

Photographs A, B and C are all of the same thing ☐

Photograph A is of a different thing ☐

Photograph B is of a different thing ☐

Photograph C is of a different thing ☐

Photographs A,B and C are all of different things ☐

Question 41

Photographs A, B and C are all of the same iron ☐

Photograph A is of a different iron ☐

Photograph B is of a different iron ☐

Photograph C is of a different iron ☐

Photographs A, B and C are all of different irons ☐

Question 42

Photographs A, B and C are all of the same aircraft ☐

Photograph A is of a different aircraft ☐

Photograph B is of a different aircraft ☐

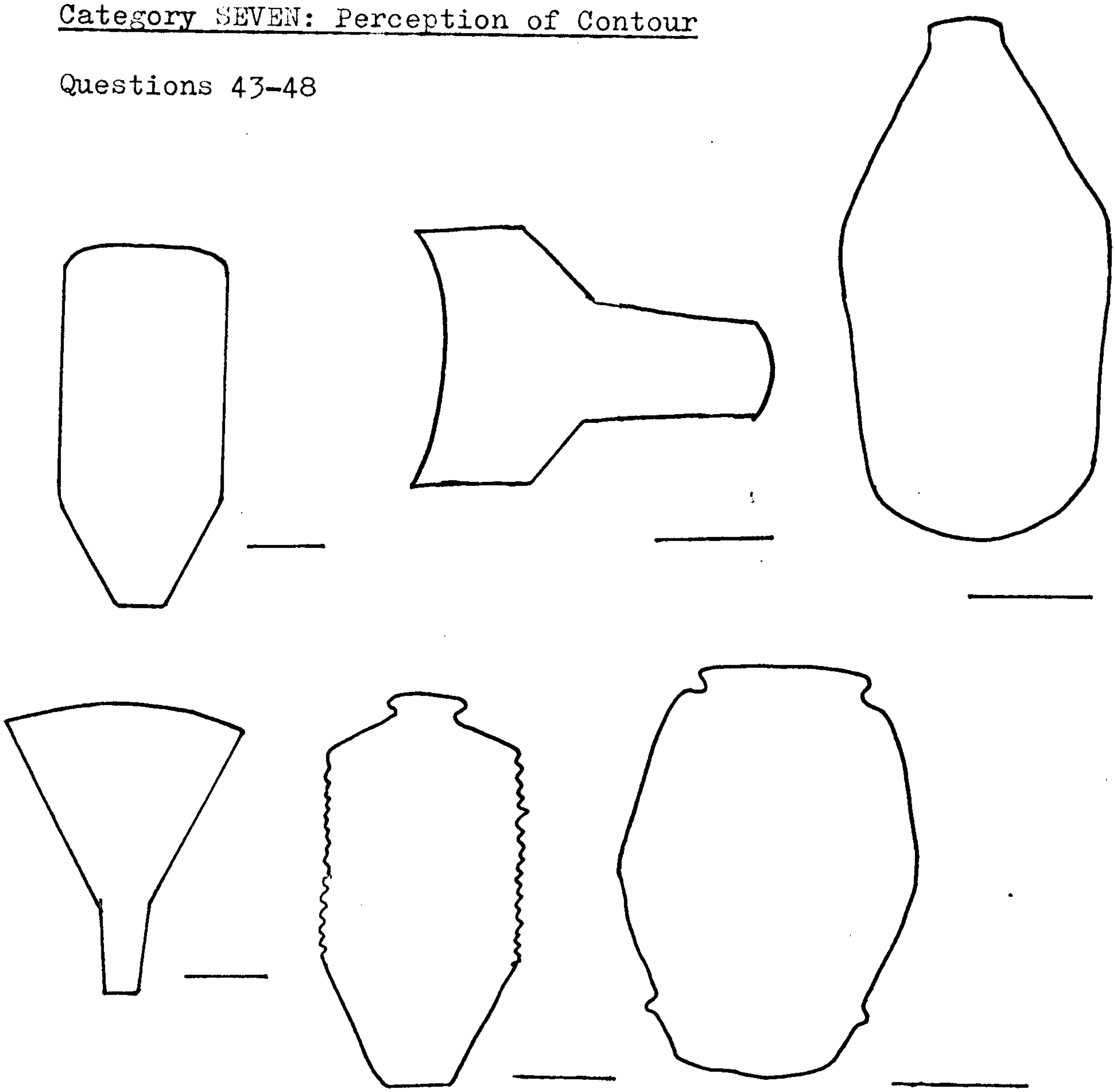
Photograph C is of a different aircraft ☐

Photographs A, B and C are all of different aircraft ☐

Answer Sheet ELEVEN

Category SEVEN: Perception of Contour

Questions 43-48



ANSWER KEY

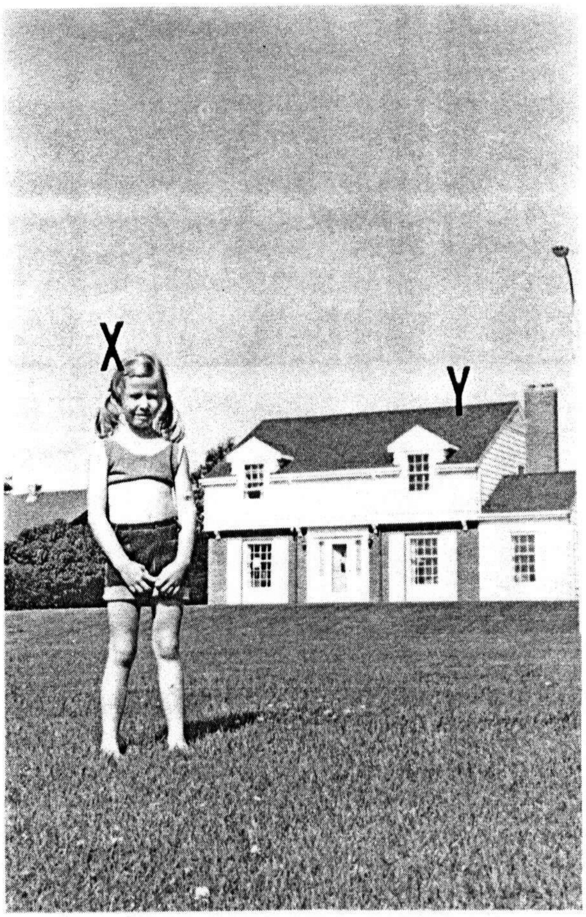
(Answers for both modified and original MPI Tests)

Q. 1 - 6	X looks nearer than Y,	X looks nearer than Y
	Y looks nearer than X,	X looks nearer than Y
	X looks nearer than Y,	Y looks nearer than X
Q. 7 - 12	11, 7, 8, 12, 10, 9	
Q. 13 - 17	2, 5, 4, 6, 3	
Q. 18 - 21	C, C, B, C	
Q. 22 - 27	A looks most like D,	A looks most like C
	A looks most like C,	B looks most like E
	A looks most like B,	A looks most like B
Q. 28 - 33	B, B, B, C, B, B	
Q. 34 - 38	Yes, no, no, no, yes	
Q. 39 - 42	B is different, all same seat, C is different, all same aircraft	
Q. 43 - 48	(original version)	47, 44, 48, 46, 43, 45
Q. 43 - 48	(modified version)	44, 48, 46, 47, 43, 45

TEST BOOKLET

TEST BOOKLET

page 1



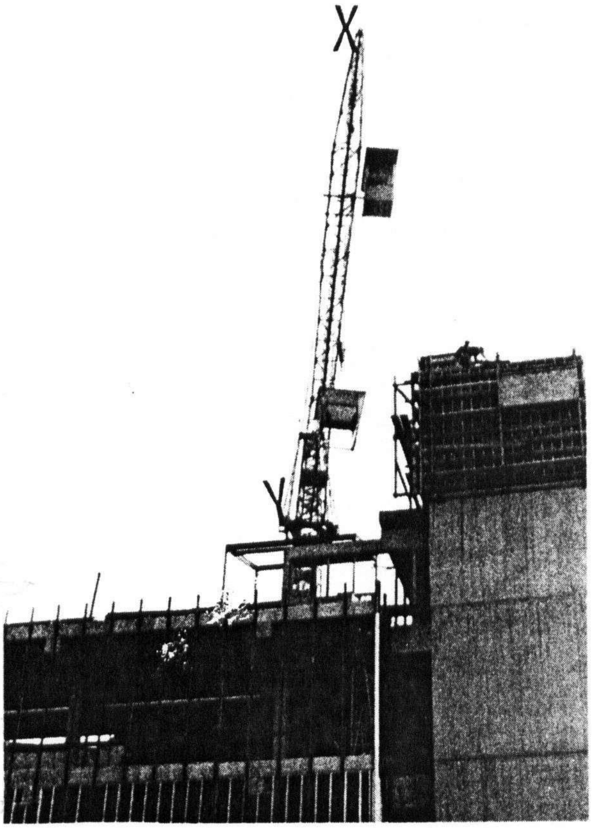
I

page 2

2

3

page 3



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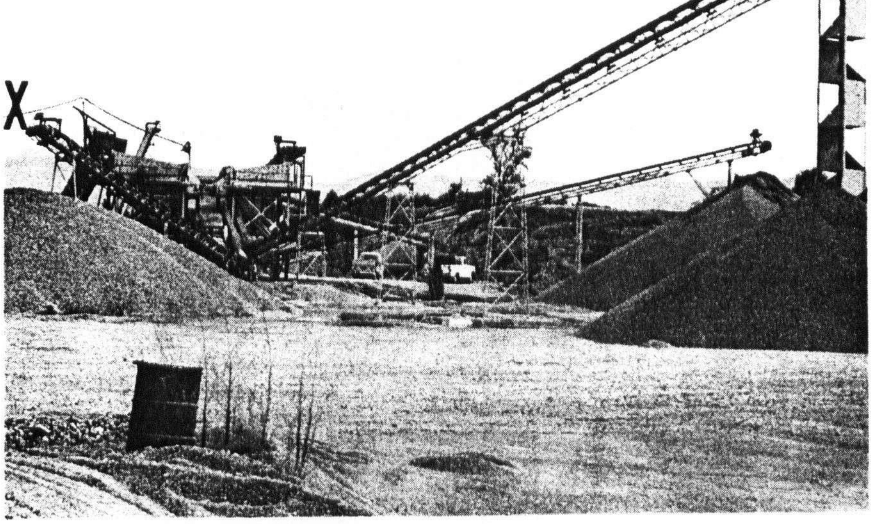

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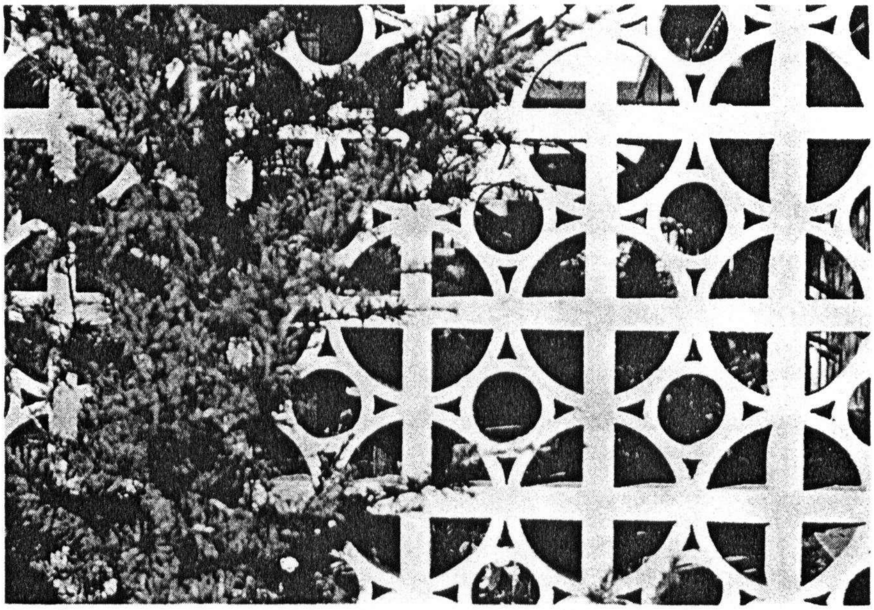

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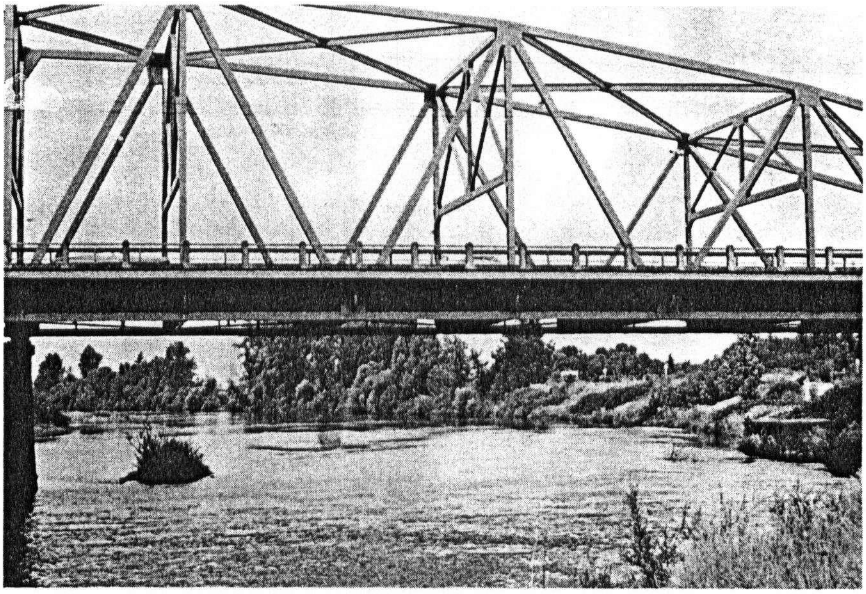

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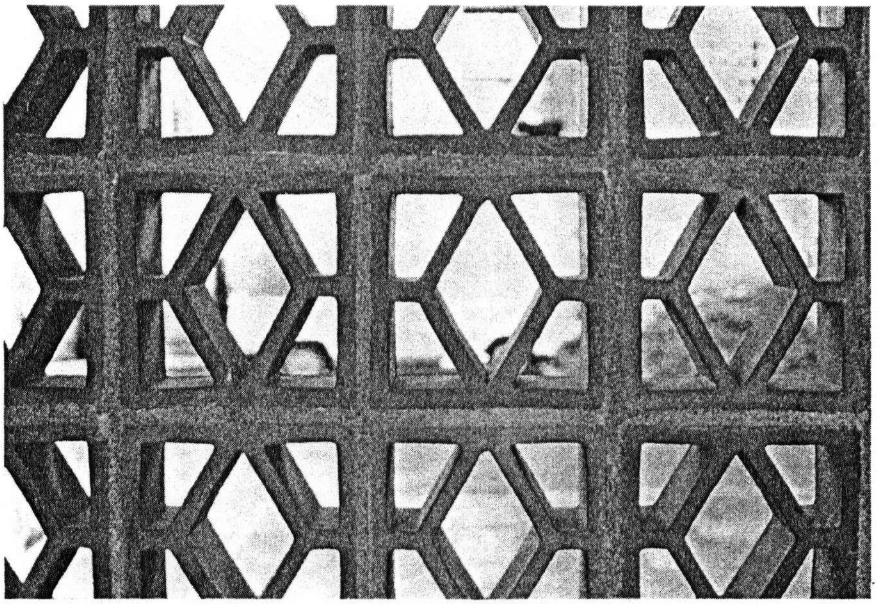

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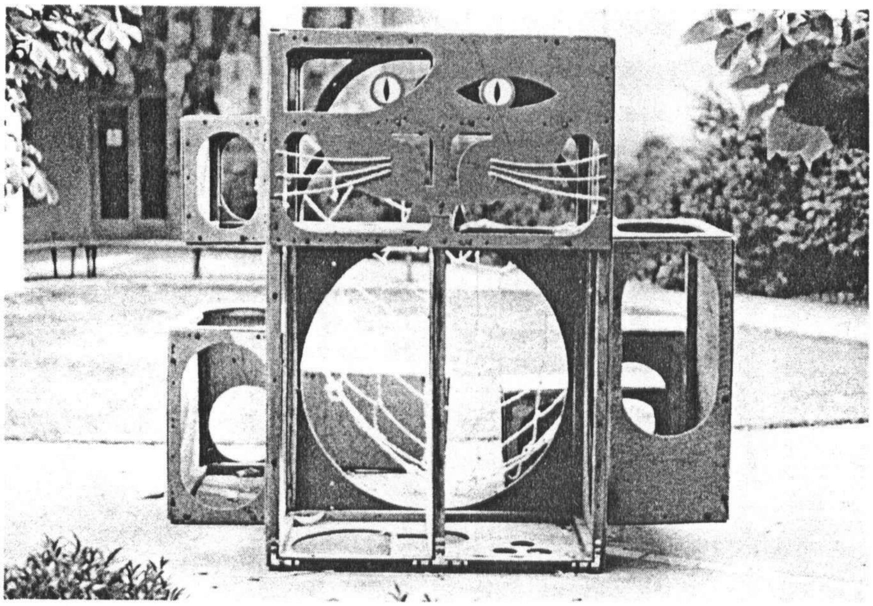

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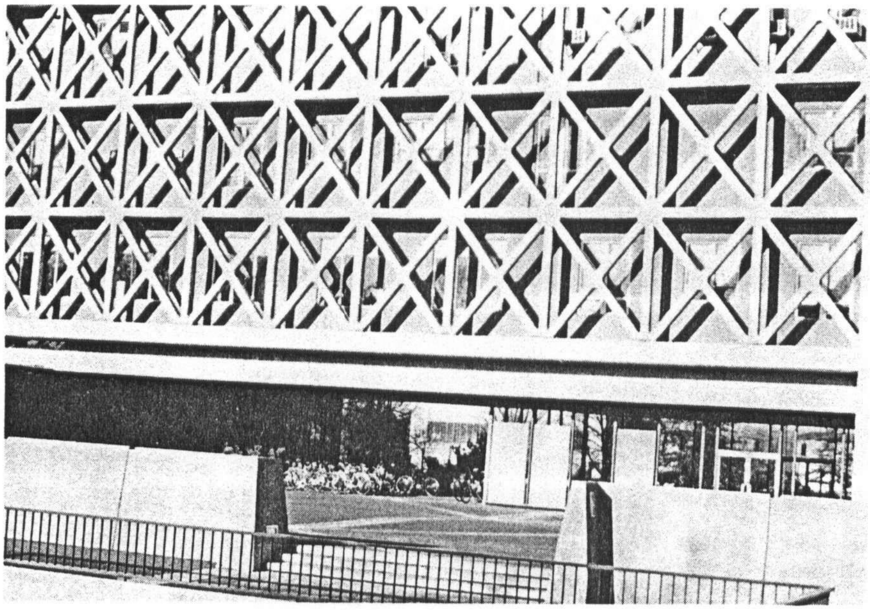

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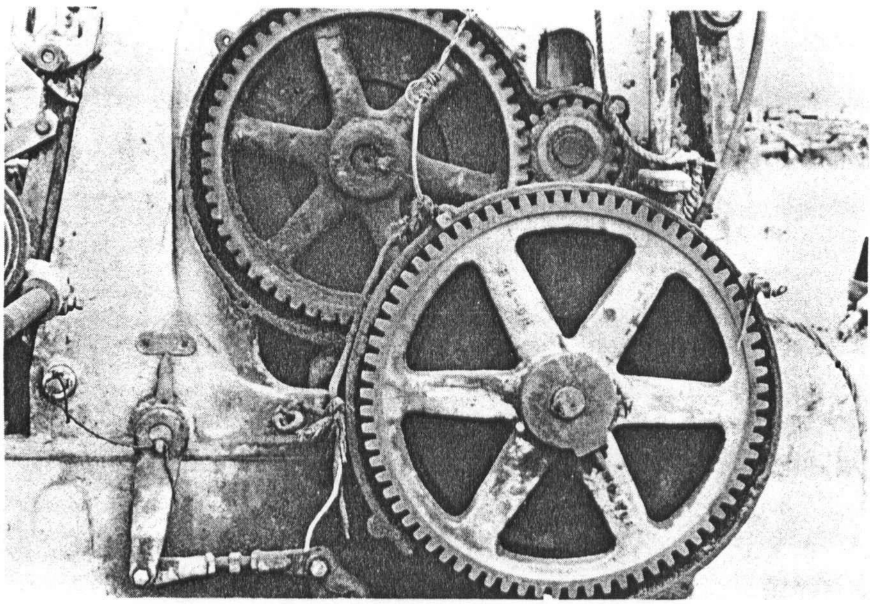

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page 6

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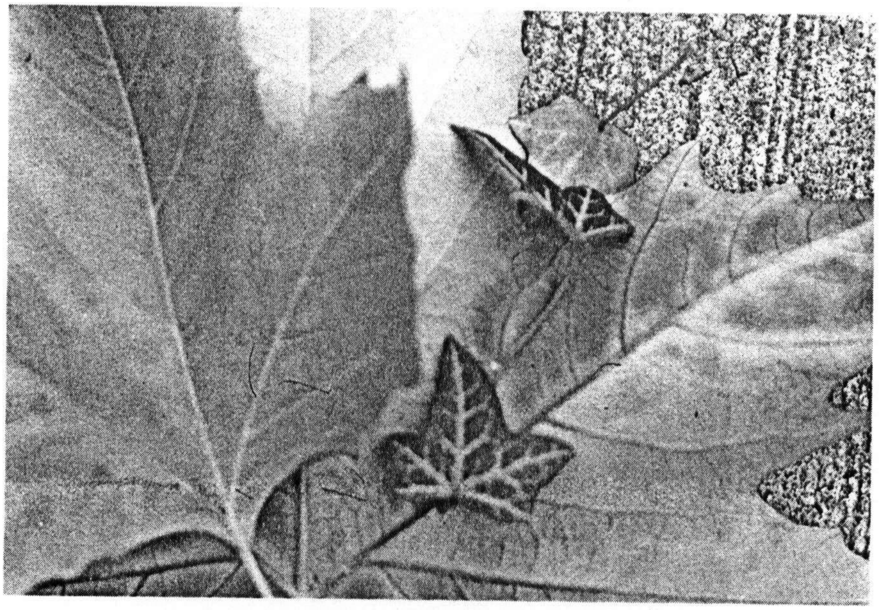

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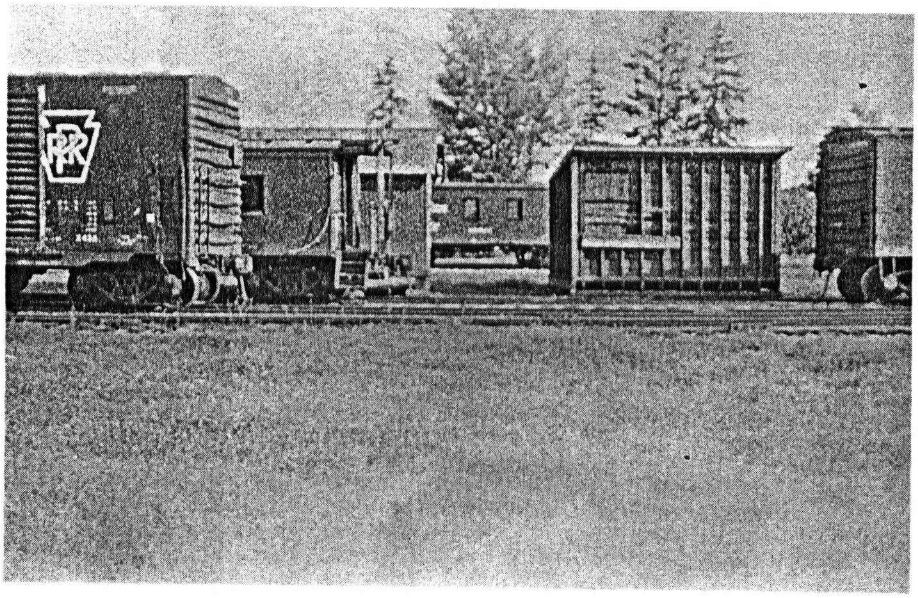

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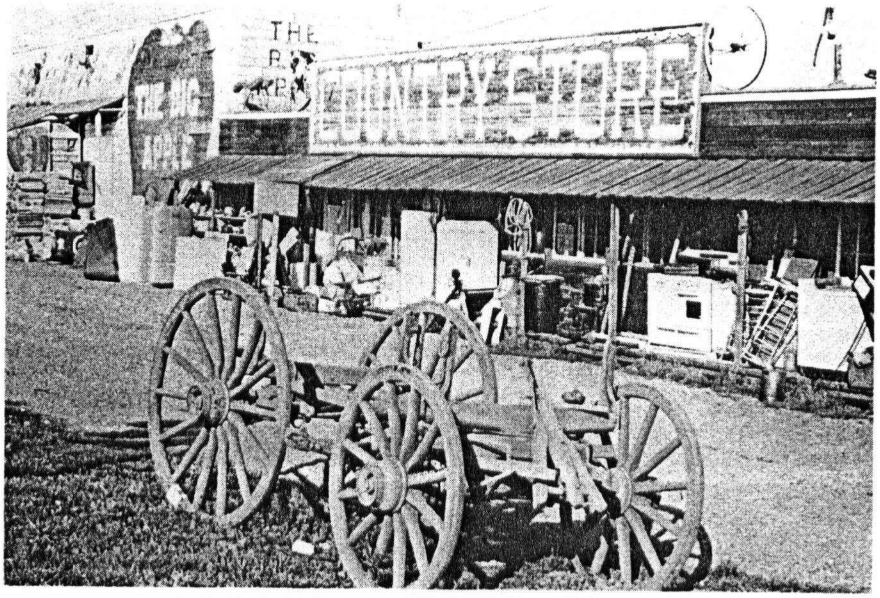

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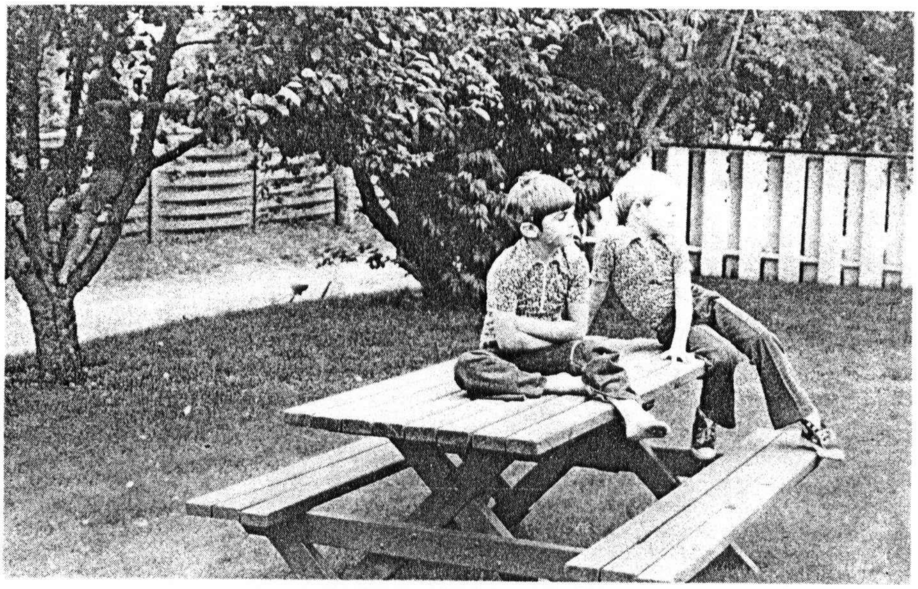

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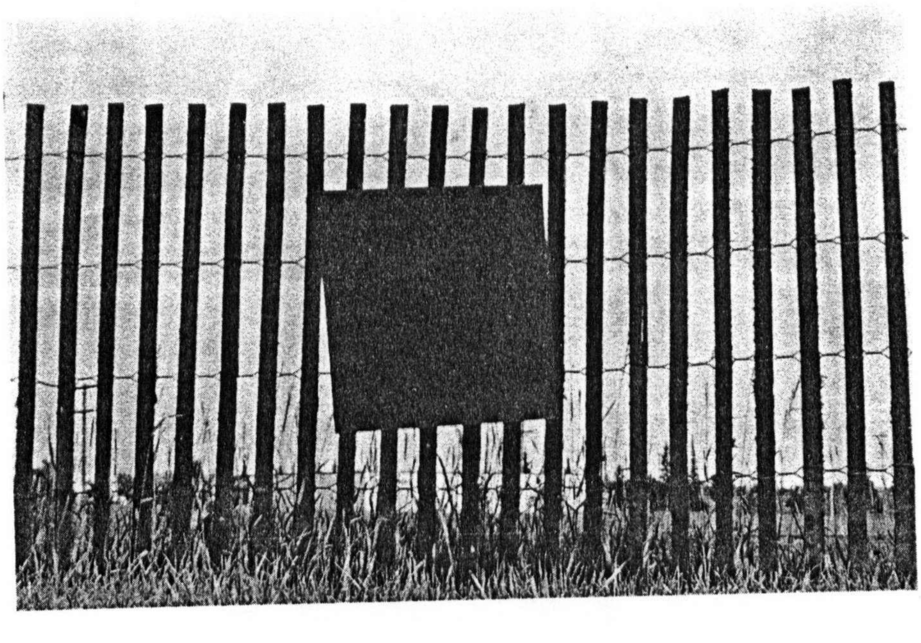

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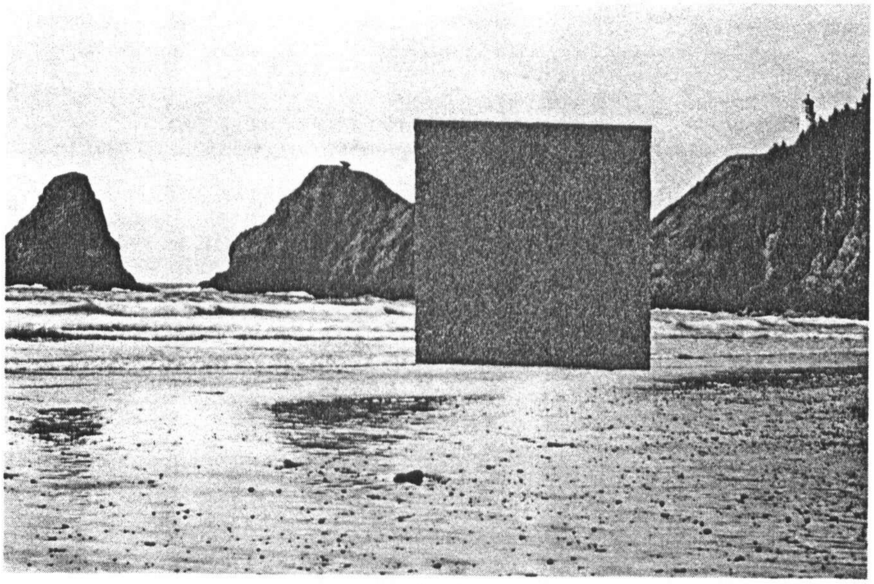

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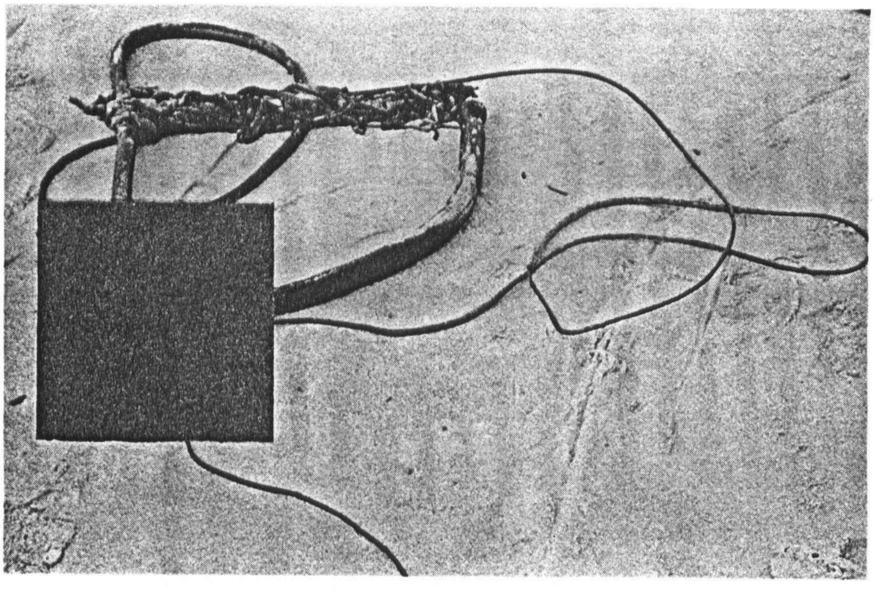

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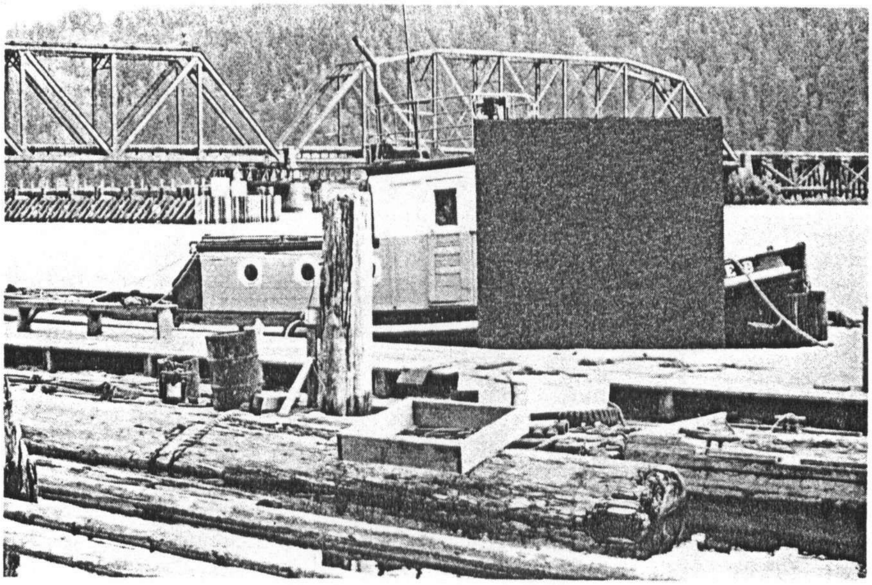

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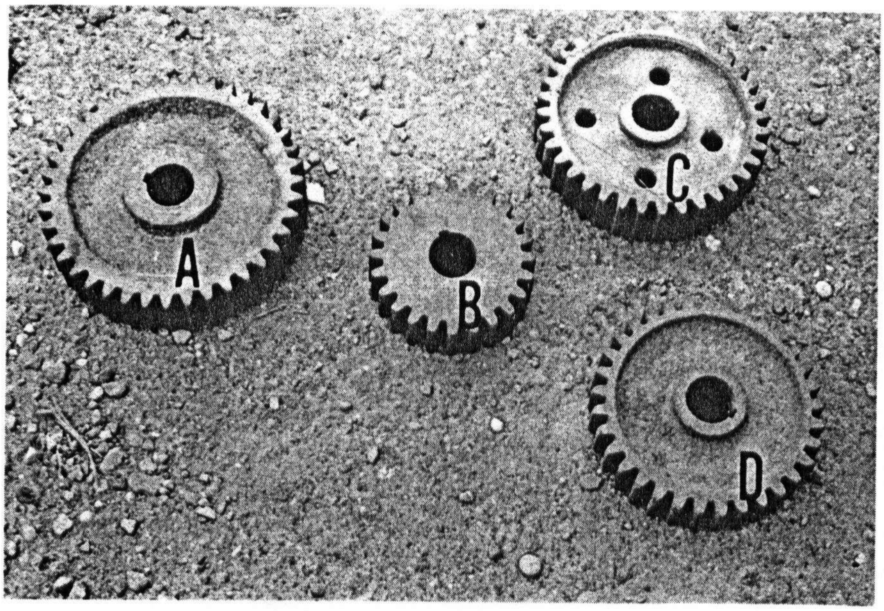

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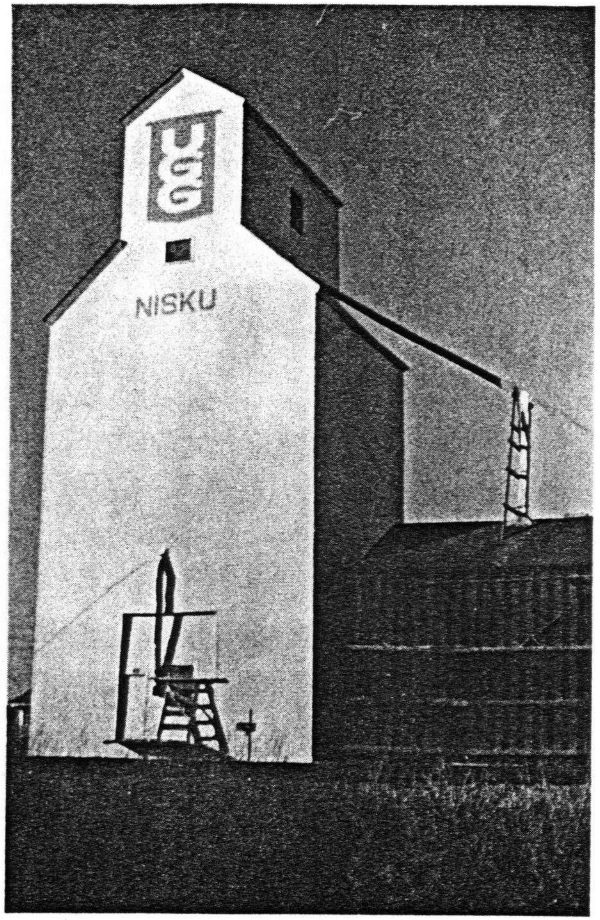
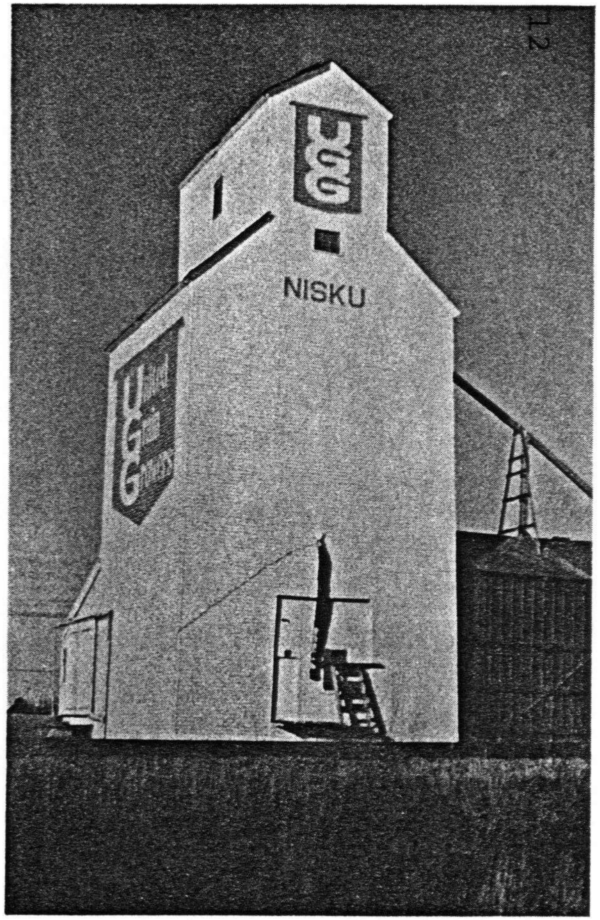


A

B



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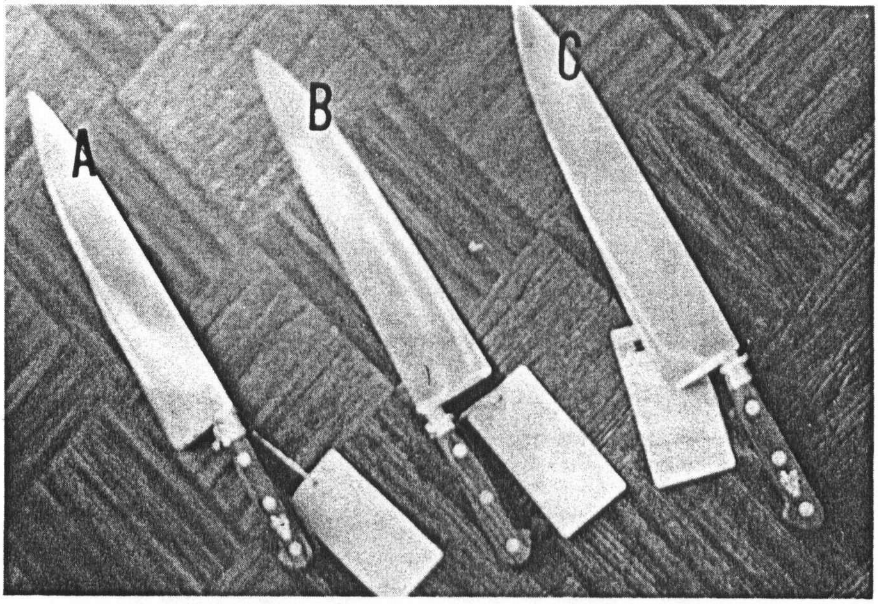

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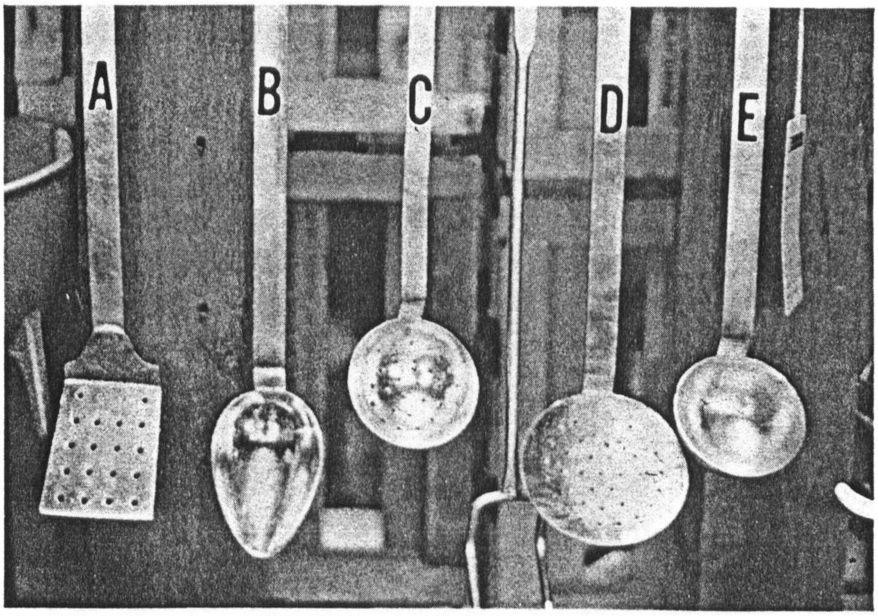

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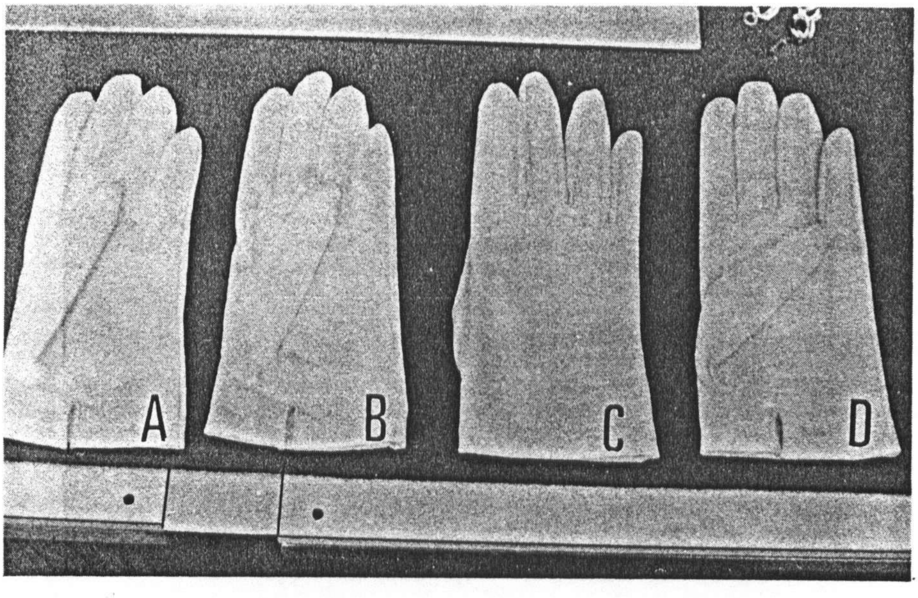

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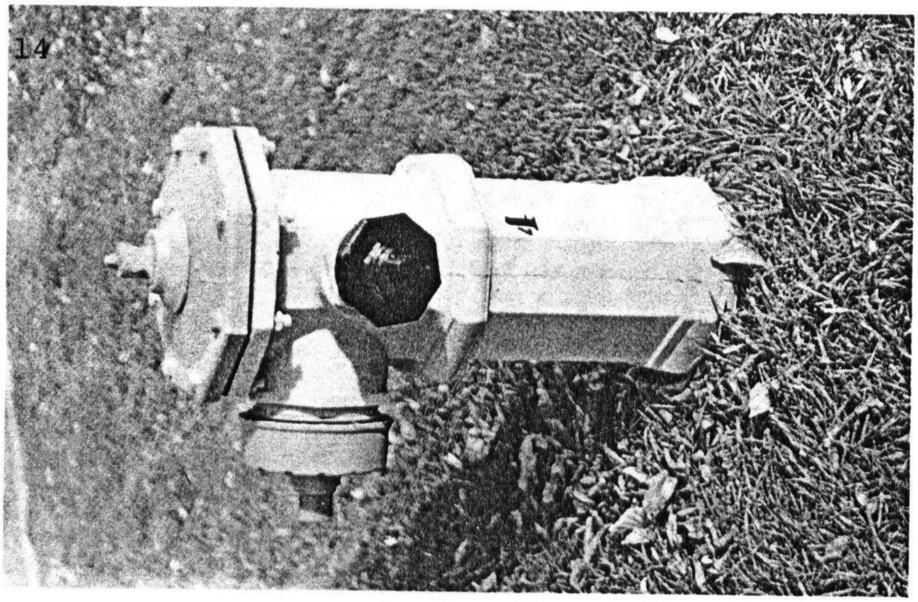

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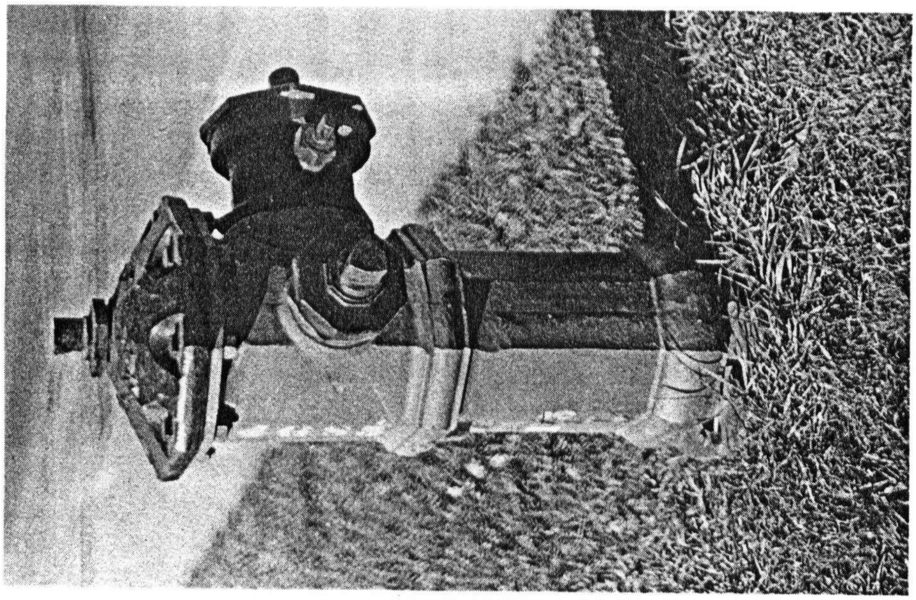

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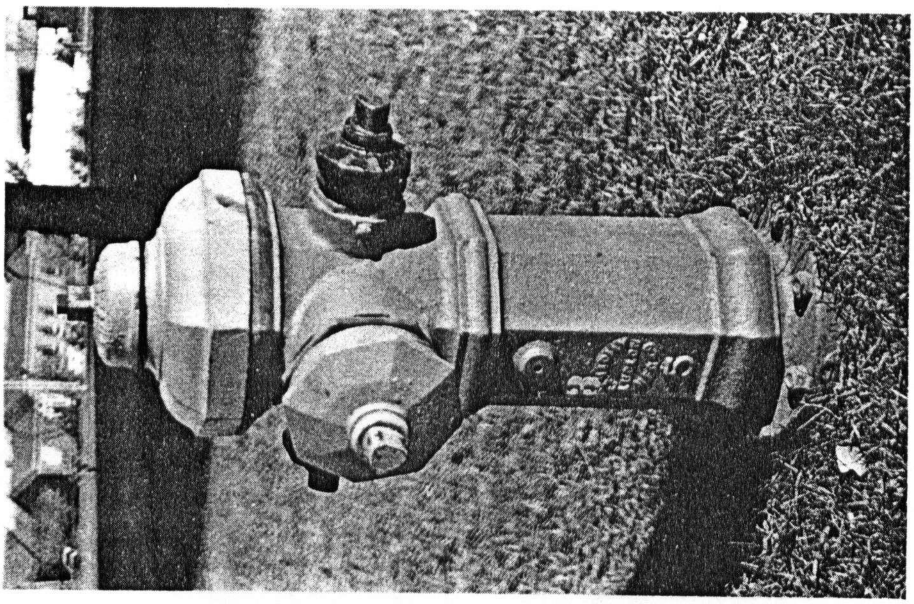
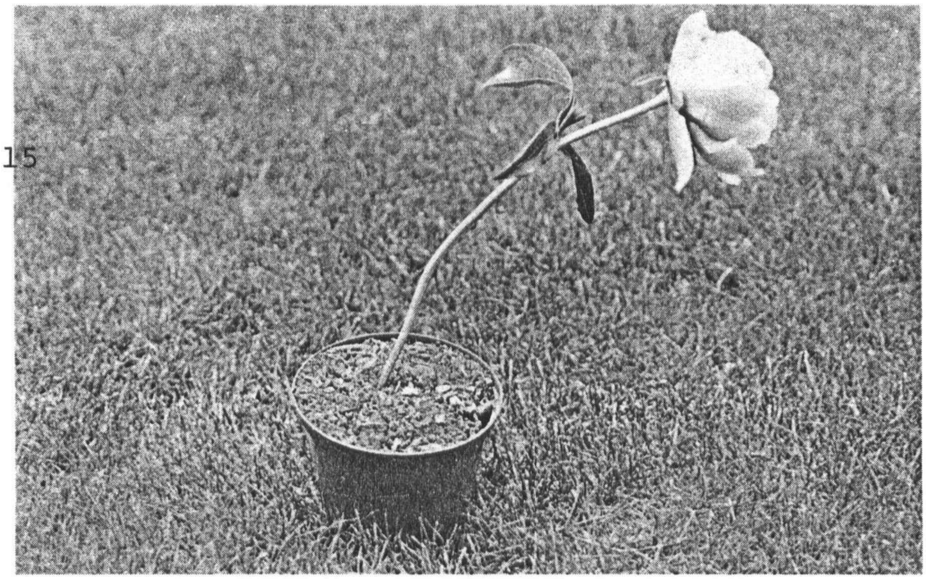


A

page 15



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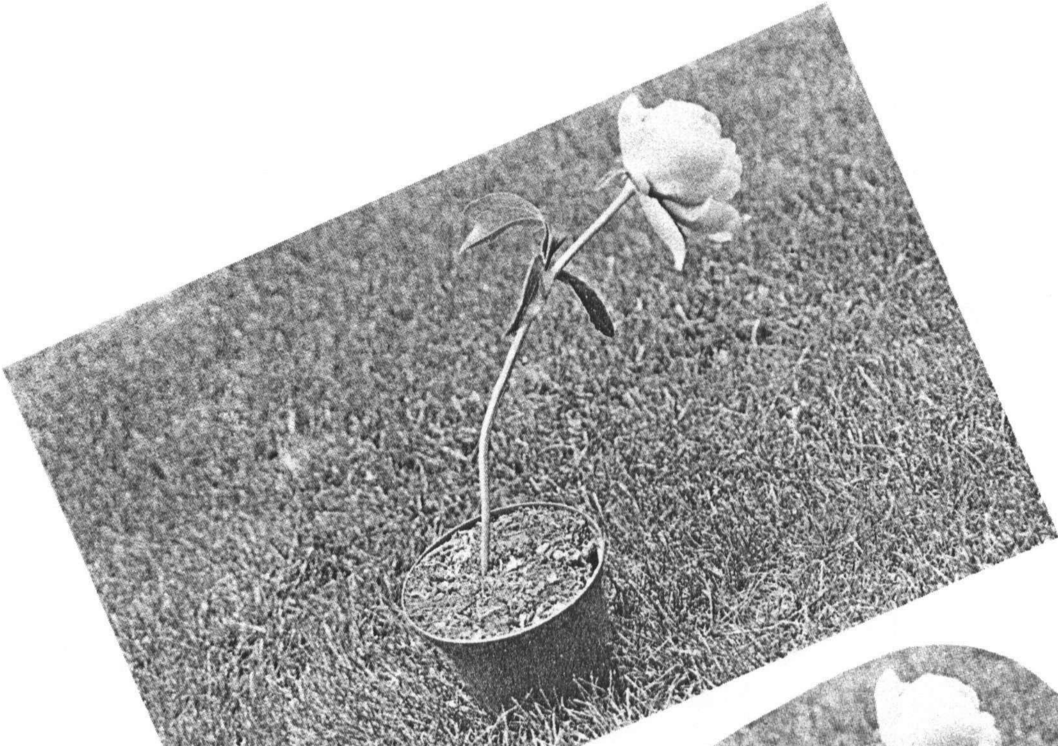

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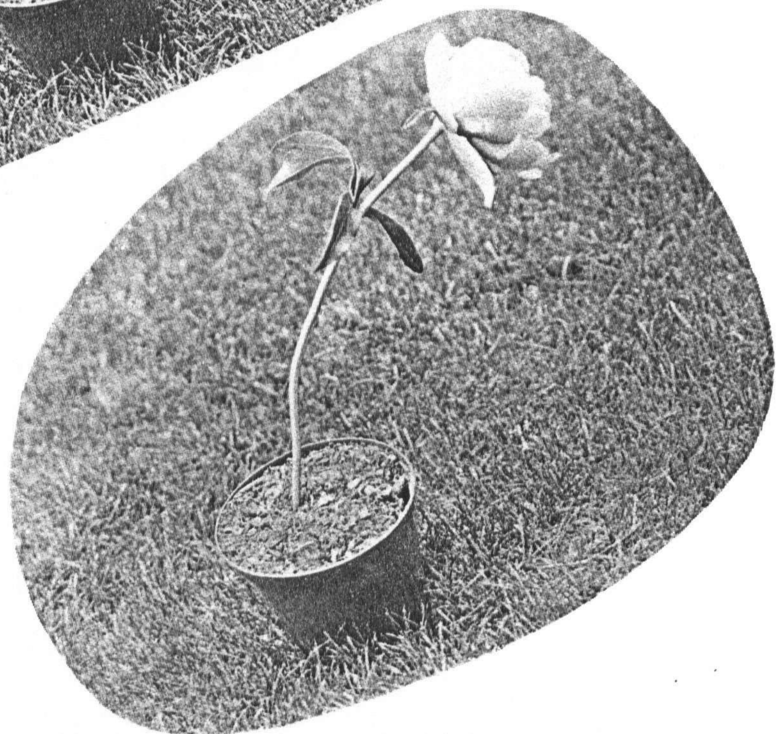

3rd stage

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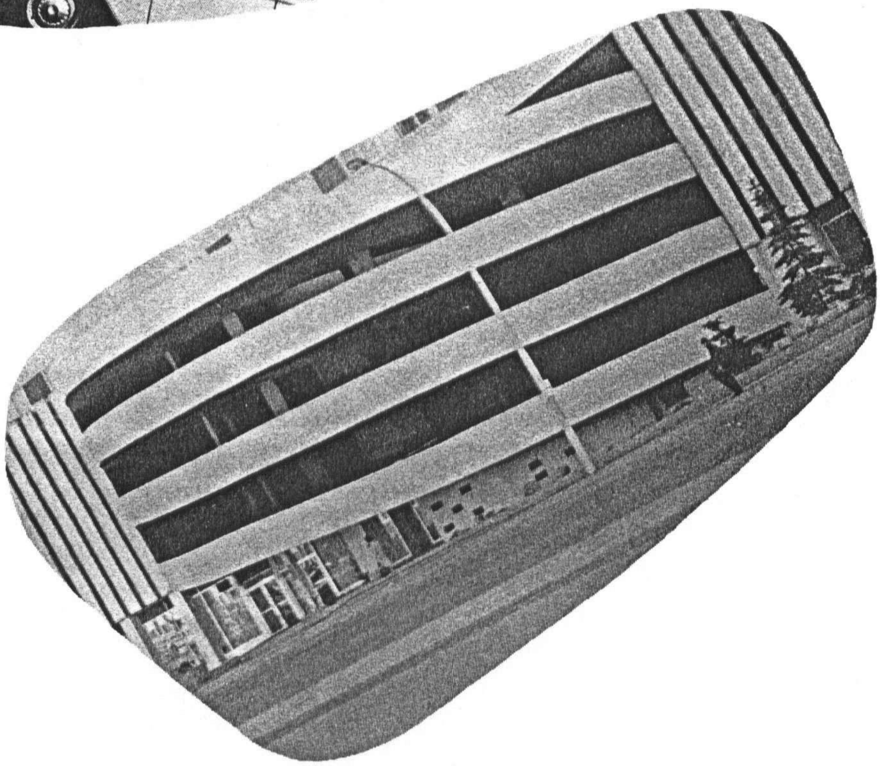

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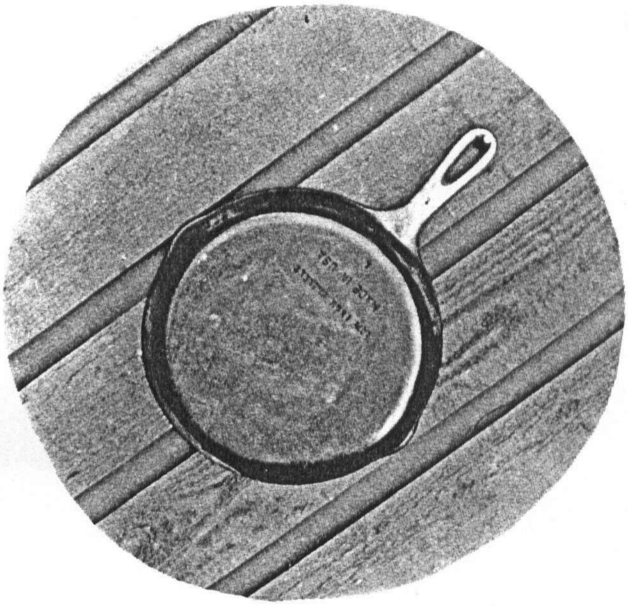

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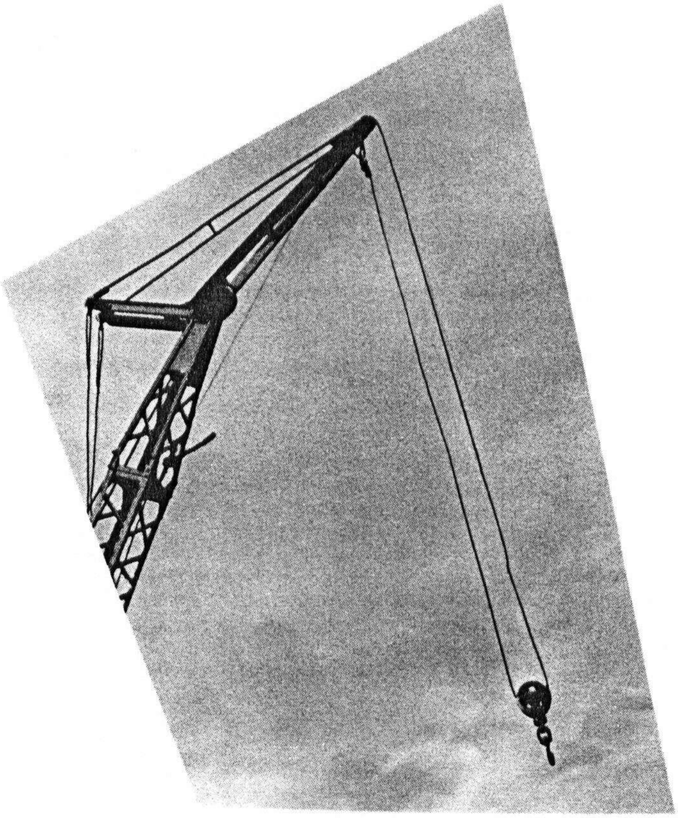

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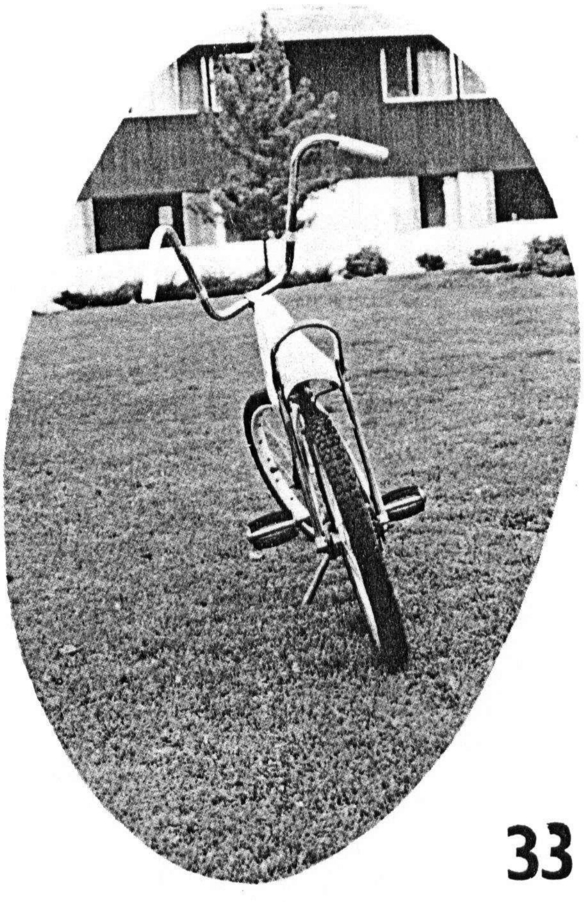

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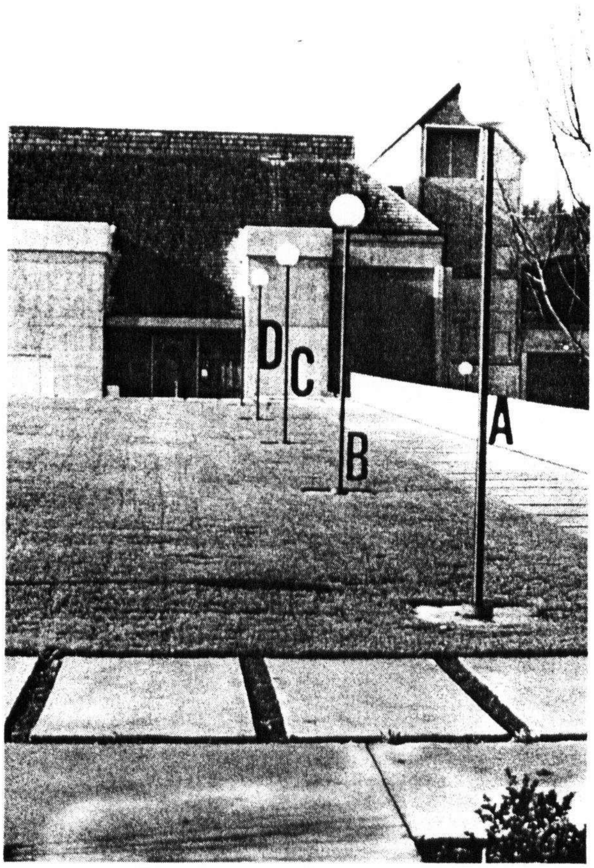

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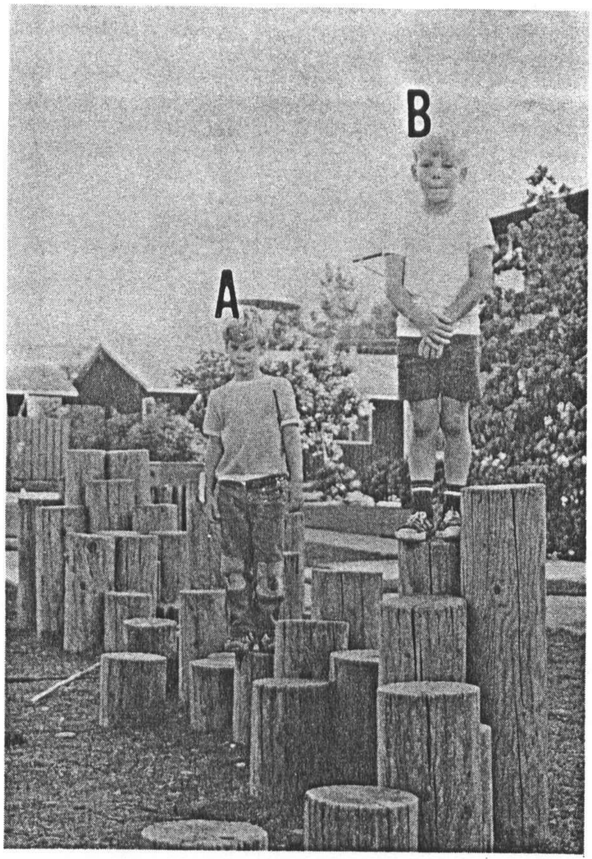

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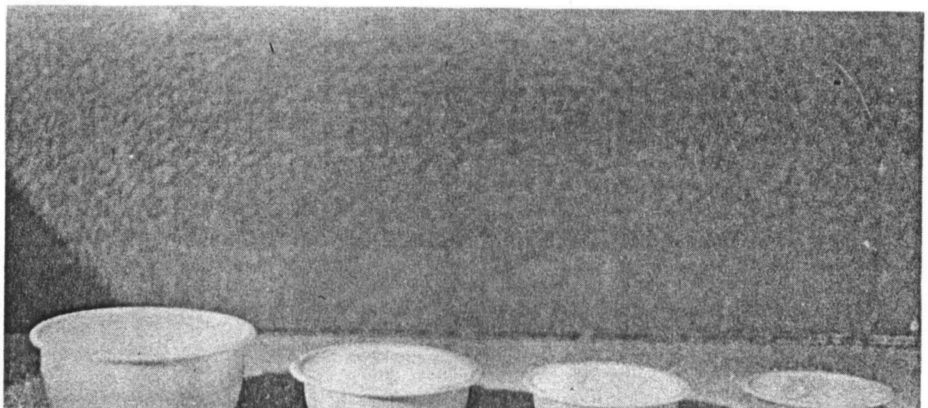

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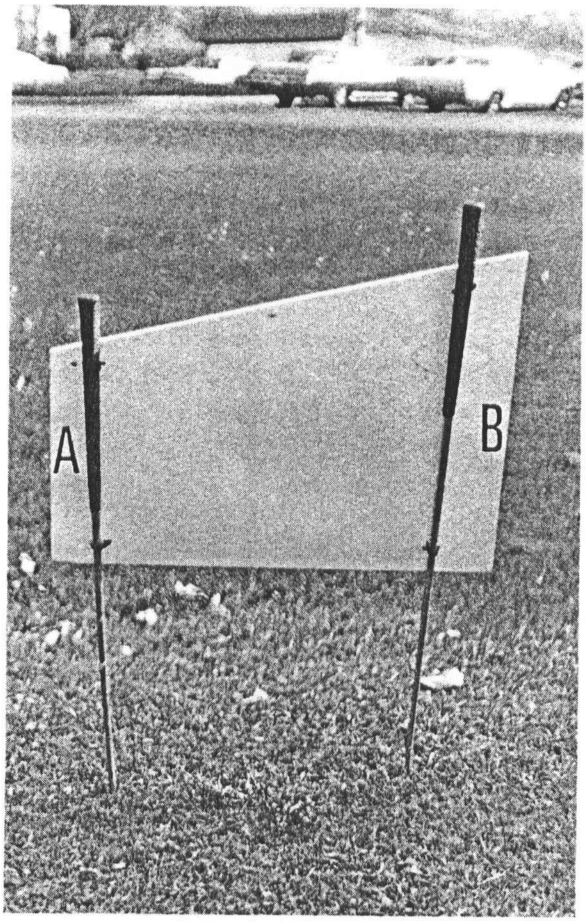

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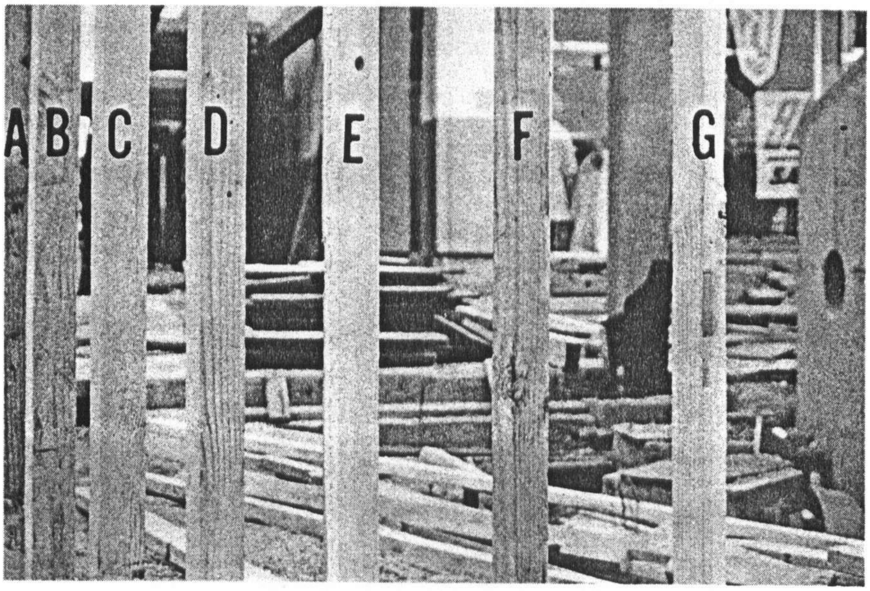

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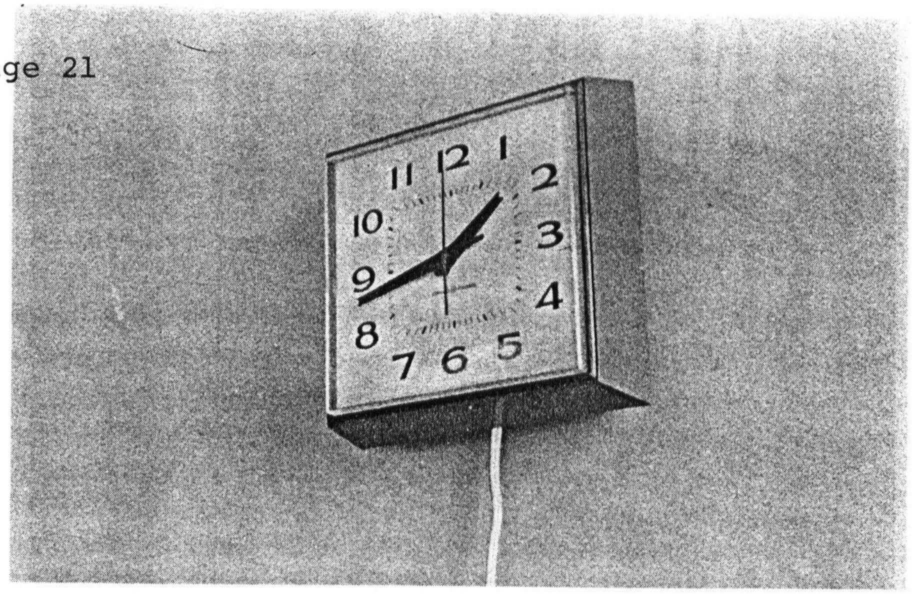

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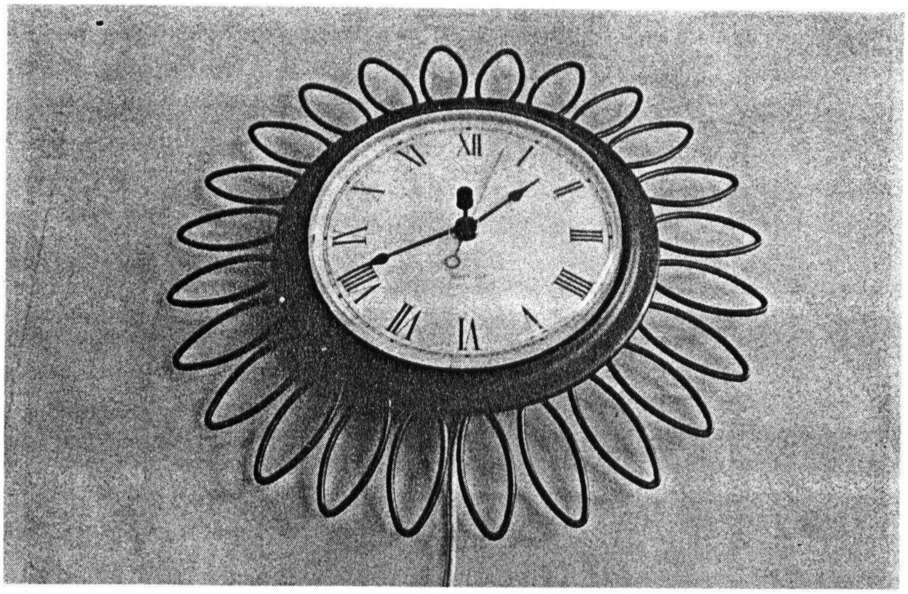

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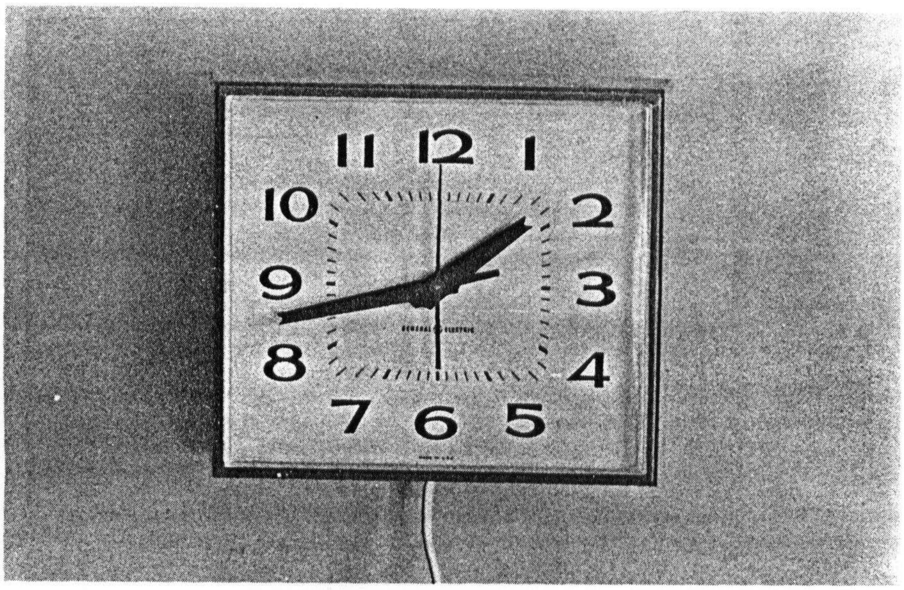
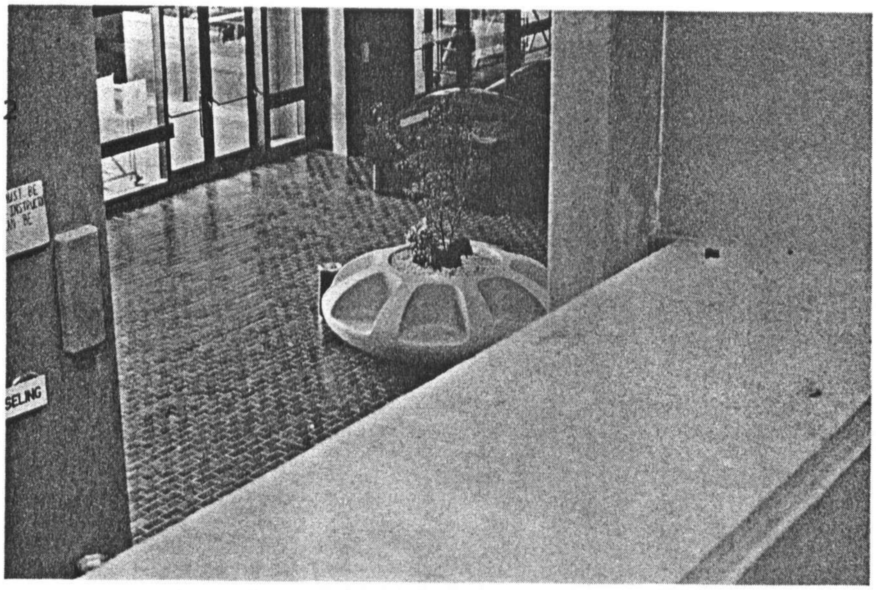


C

page 22



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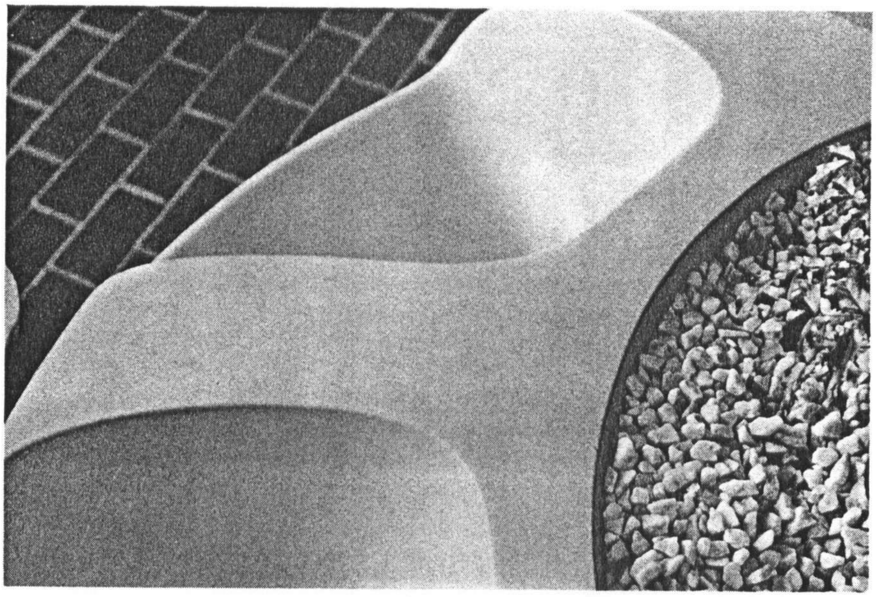

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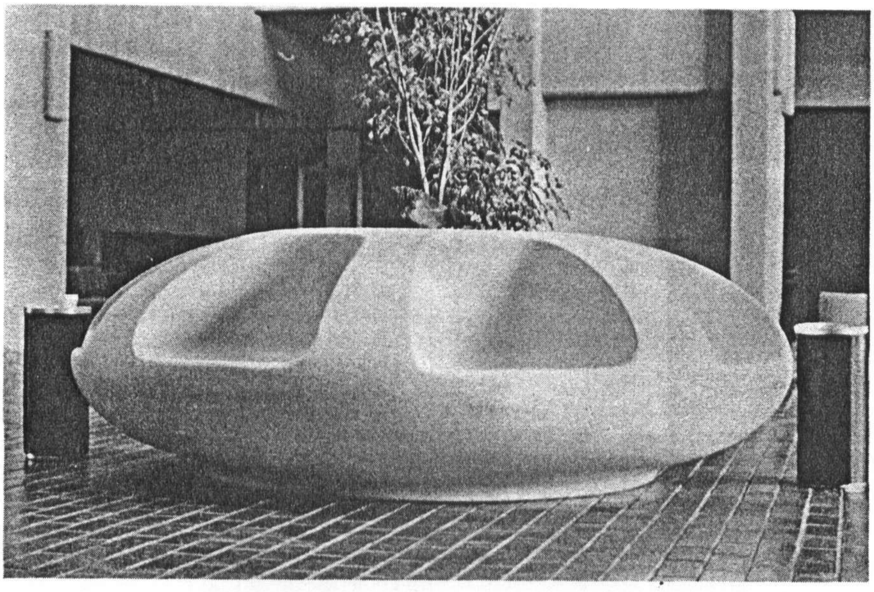
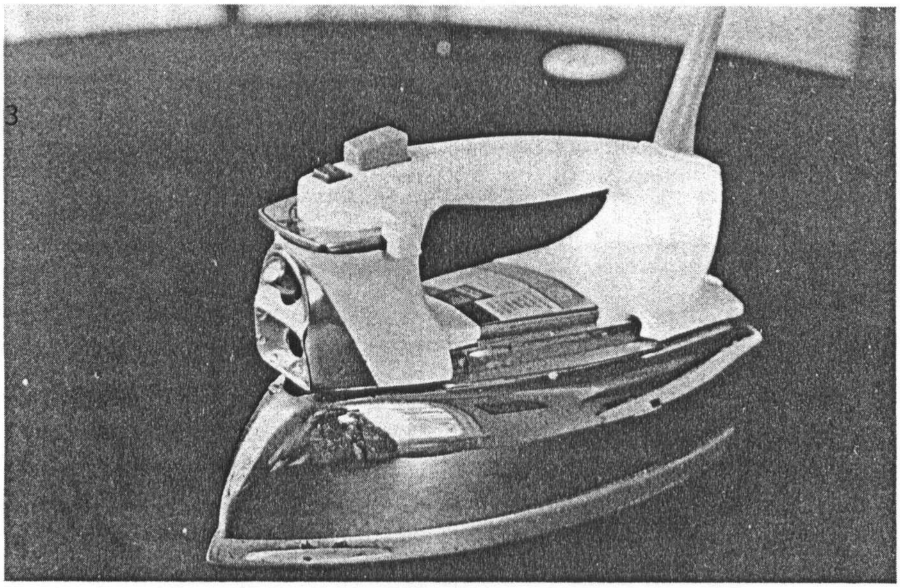


C 40

page 23



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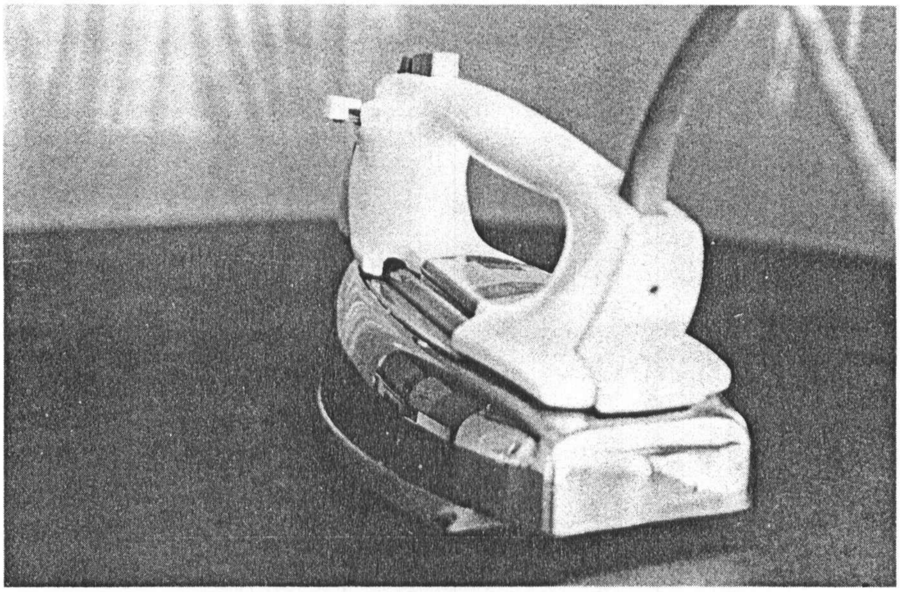

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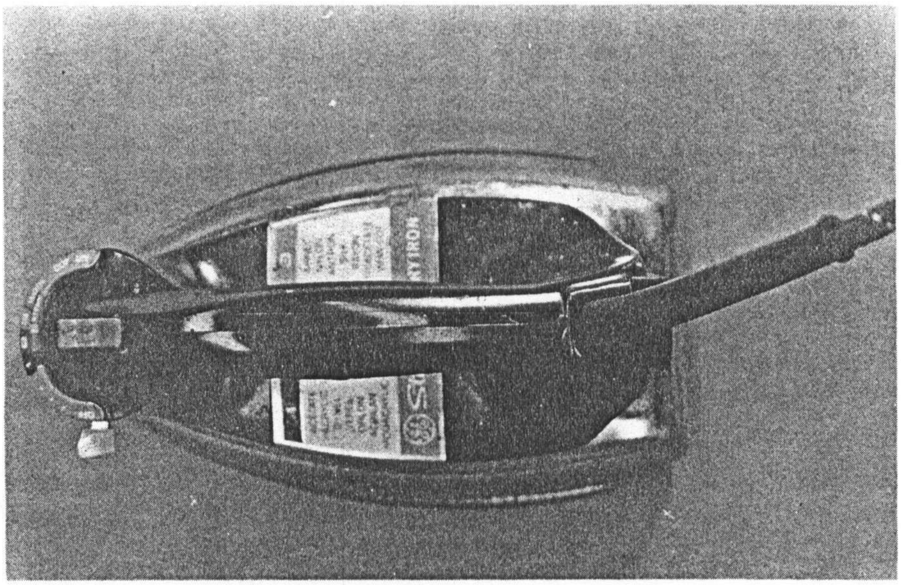
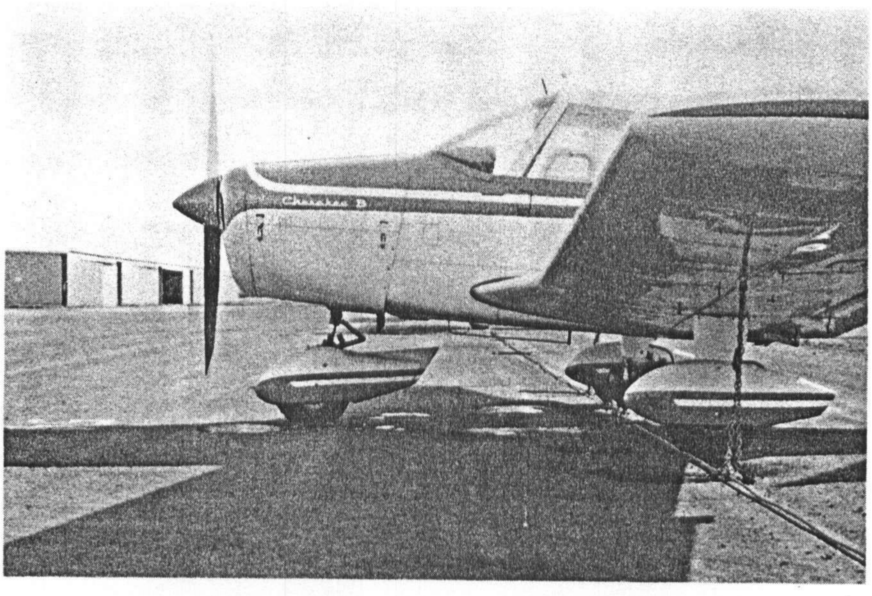


C 41

A

B



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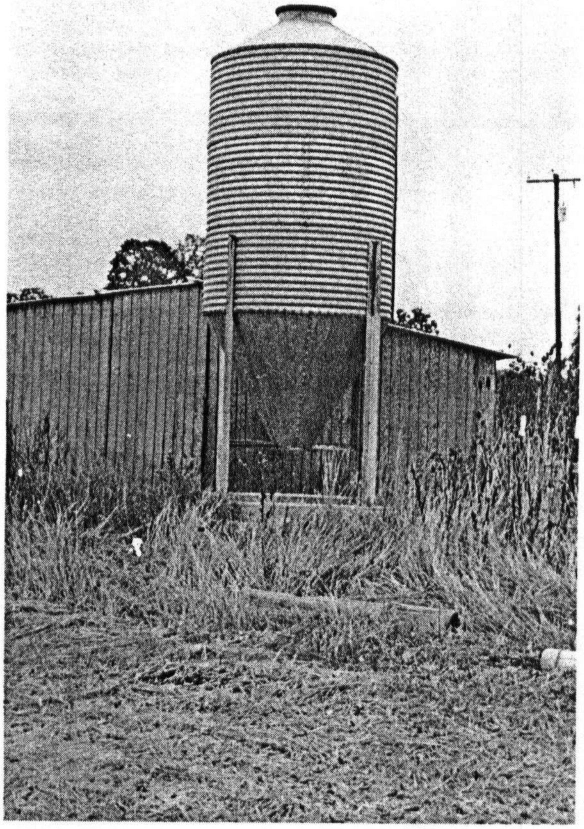

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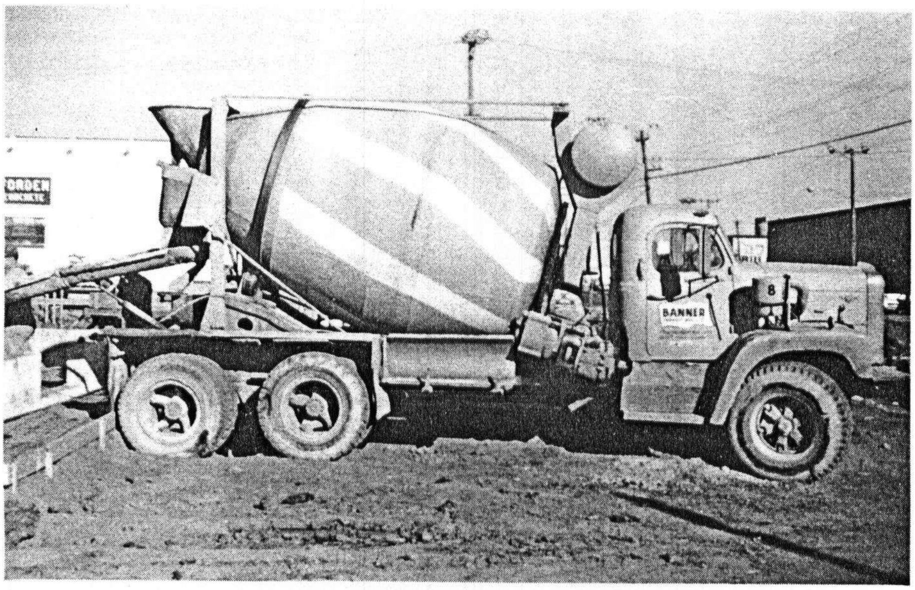

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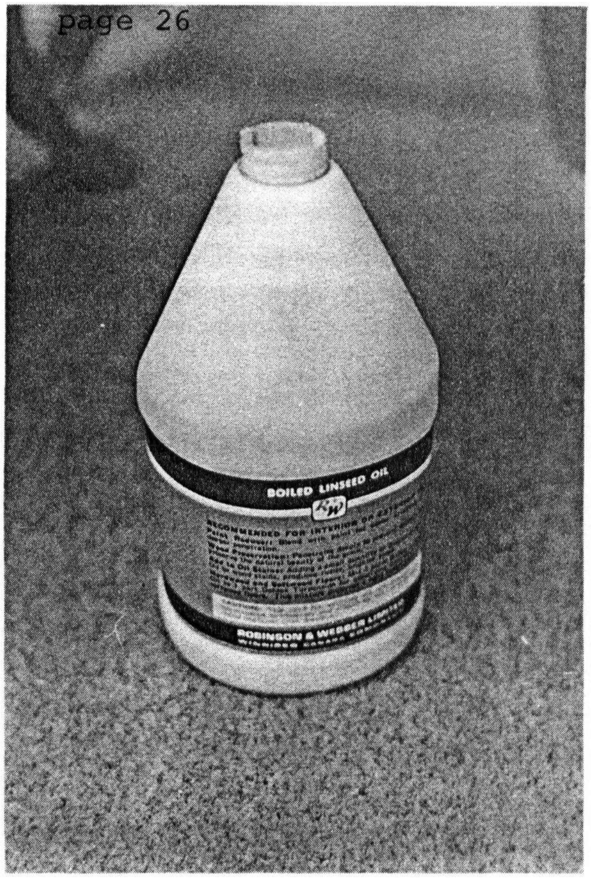

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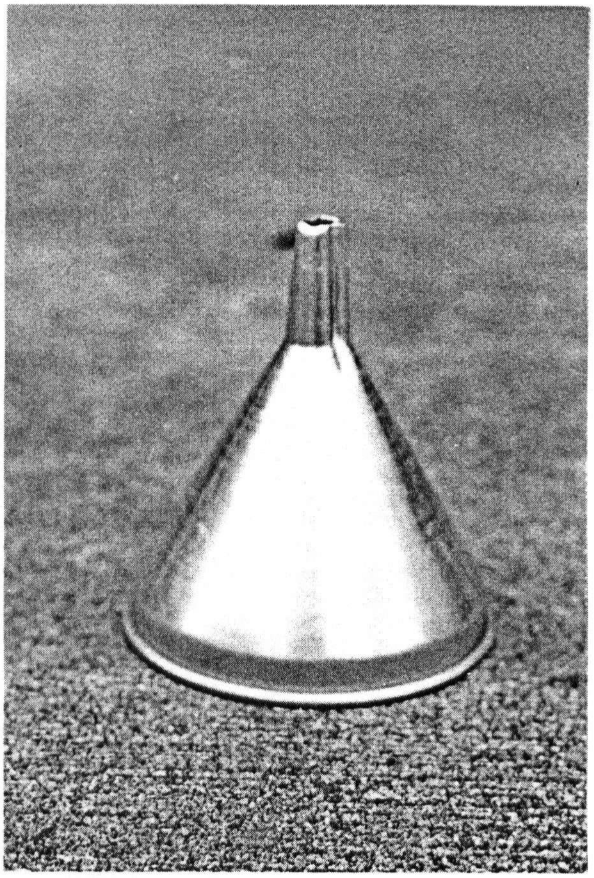

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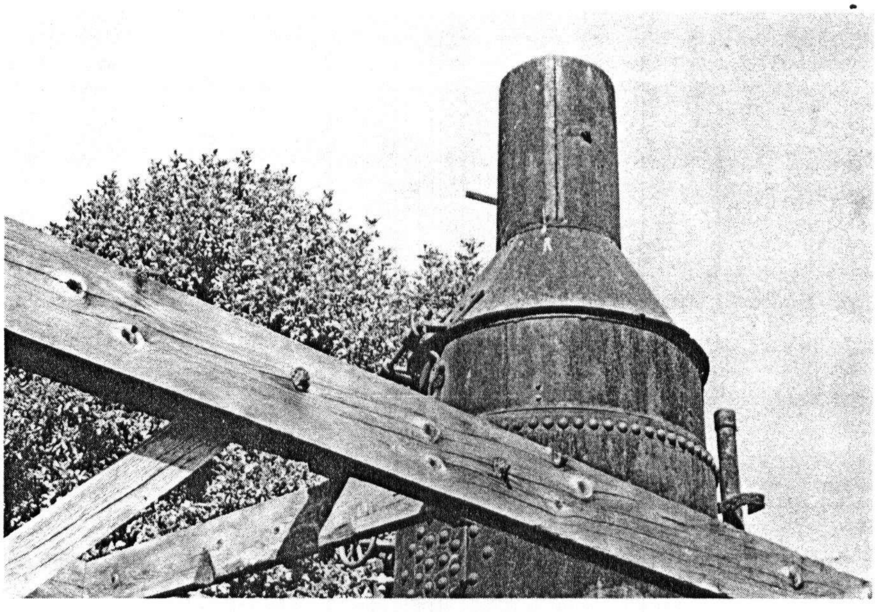

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APPENDIX C

Responses to the MPI

NON-GIFTED / GIFT[ED]

		Grade 5 Girls 1	2	3	4	5	Grade 5 Boys 1	2	3	4	5	6	7	8	Grade 6 Girls 1	2	3	4	5	6	Grade 6 Boys 1	2	3	4	5	6	7	8	9	Gifted Grade 5 Girls 1	2	3	4	5	6
Category 1	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	\	·	·	·	·	·	·
	2	·	·	·	·	·	·	·	·	·	\	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
	3	·	·	·	·	·	·	·	·	\	\	\	·	\	·	·	·	·	·	·	·	·	·	·	\	·	·	\	\	·	·	·	·	·	\
	4	\	·	\	\	\	\	\	·	\	·	·	\	\	\	\	\	·	·	\	·	·	\	\	\	\	~	\	·	\	\	·	·	·	·
	5	·	\	\	\	\	·	\	\	·	\	\	·	\	\	\	\	\	·	·	·	·	·	\	·	·	·	\	\	·	·	\	·	\	\
	6	·	·	·	\	·	·	\	\	\	\	\	·	·	·	·	·	·	·	·	·	\	·	·	\	·	·	\	\	·	·	·	\	·	·
	7	·	·	·	·	·	·	·	\	\	·	·	\	·	·	\	·	·	·	·	·	·	·	·	·	·	·	·	\	\	·	\	\	·	·
Category 2	8	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	\	·	·	·	·	·	·
	9	·	·	·	·	·	·	·	·	·	·	·	\	·	·	\	·	·	·	·	·	·	·	·	·	·	·	\	\	\	·	\	·	·	·
	10	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	\	·	·	·	·	·	·
	11	·	·	·	·	·	·	·	\	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	\	·	·	·	·	·	·
	12	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	\	·	·	·	\	·	·	·	·	·	·
	13	·	\	·	·	\	·	·	·	·	\	·	·	·	·	·	·	\	·	·	·	\	·	·	·	·	·	·	·	\	·	·	·	·	·
Category 3	14	\	·	\	\	·	\	\	\	·	\	·	·	\	·	·	·	·	·	·	\	\	\	·	\	\	\	·	\	·	\	·	\	\	\
	15	\	\	\	\	\	·	·	\	\	·	\	\	\	\	\	\	\	\	\	\	\	\	·	·	\	\	\	\	\	\	\	\	\	·
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	19	·	·	\	\	·	·	·	·	\	\	\	\	·	·	·	\	·	·	\	·	\	·	·	·	\	·	·	\	·	\	·	·	·	·
	20	·	\	\	·	·	\	·	\	·	\	·	\	\	\	\	·	·	·	\	\	·	\	·	·	·	·	\	\	\	·	·	\	·	·
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Category 4	22	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	\	·	·	·	·	·	·	·	·	·	·	·
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Totals		37	33	32	30	32	37	32	30	27	22	30	30	31	35	33	38	36	39	36	35	27	35	36	32	37	37	32	23	36	38	36	35	37	40

HRADE 5			GRADE 6																		
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35	37	40	35	38	38	33	39	35	41	38	36	40	41	41	43	38	34	38	26	33/48	

APPENDIX D

Authorization Letters

The Holt School

20th May, 1985.

Dear Parents,

Ms. Robyn Collier is undergoing post-graduate work in Education. She would like to test a random sample of Year 5/6 children at our school. The children would be asked to look at a series of 'pictures'. The children would then respond to a set of three or four answers by indicating which one best describes the picture. The time required would be a maximum of one hour. The Schools Authority has given approval for this study.

We are seeking your approval for your child to be involved in this project. Please complete the slip below if you have no objections.

R.D. Blakey
Acting Principal.

RANDOM SAMPLE - RETURN SLIP

I hereby give approval for my son/daughter ....

to be involved in this study.

....
Signed Parent/Guardian

LYONS PRIMARY SCHOOL

27 March 1985

Dear Parents,

Ms. Robyn Collier is undergoing post-graduate work in Education. She would like to test a random sample of Year 5/6 children at our school. The children would be asked to look at a series of 'pictures'. The children would then respond to a set of three or four answers by indicating which one best describes the picture. The time required would be a maximum of one hour. The Schools Authority has given approval for this study.

We are seeking your approval for your child to be involved in this project. Please complete the slip below if you have no objections.

A. BISHOP

ACTING PRINCIPAL

RANDOM SAMPLE - RETURN SLIP

I hereby give approval for my son/daughter .... to be involved in this study.

.... Parent/Guardian

APPENDIX E

Test Schedule

APPENDIX E

Test Schedule

	Date	Time
Group A	April 11	9:05 - 9:45 am
	11	10:35 - 11:10 am
Group B	11	11:30 - 12:05 pm
	12	9:05 - 9:45 am
	12	11:15 - 11:45 am
Group C	23	9:30 - 10:05 am
	23	10:35 - 11:05 am
Group D	23	11:30 - noon
	24	9:30 - 10:10 am
	24	10:35 - 11:10 am

APPENDIX F

Mann-Whitney U. Table of Critical Values

TABLE K. TABLE OF CRITICAL VALUES OF U IN THE MANN-WHITNEY TEST* (*Continued*)

Table K_{IV}. Critical Values of U for a One-tailed Test at $\alpha = .05$ or for a Two-tailed Test at $\alpha = .10$

n_2 \ n_1	9	10	11	12	13	14	15	16	17	18	19	20
1											0	0
2	1	1	1	2	2	2	3	3	3	4	4	4
3	3	4	5	5	6	7	7	8	9	9	10	11
4	6	7	8	9	10	11	12	14	15	16	17	18
5	9	11	12	13	15	16	18	19	20	22	23	25
6	12	14	16	17	19	21	23	25	26	28	30	32
7	15	17	19	21	24	26	28	30	33	35	37	39
8	18	20	23	26	28	31	33	36	39	41	44	47
9	21	24	27	30	33	36	39	42	45	48	51	54
10	24	27	31	34	37	41	44	48	51	55	58	62
11	27	31	34	38	42	46	50	54	57	61	65	69
12	30	34	38	42	47	51	55	60	64	68	72	77
13	33	37	42	47	51	56	61	65	70	75	80	84
14	36	41	46	51	56	61	66	71	77	82	87	92
15	39	44	50	55	61	66	72	77	83	88	94	100
16	42	48	54	60	65	71	77	83	89	95	101	107
17	45	51	57	64	70	77	83	89	96	102	109	115
18	48	55	61	68	75	82	88	95	102	109	116	123
19	51	58	65	72	80	87	94	101	109	116	123	130
20	54	62	69	77	84	92	100	107	115	123	130	138

* Adapted and abridged from Tables 1, 3, 5, and 7 of Auble, D. 1953. Extended tables for the Mann-Whitney statistic. *Bulletin of the Institute of Educational Research at Indiana University*, 1, No. 2, with the kind permission of the author and the publisher.

Source: Sidney Siegel (1956), Nonparametric Statistics for the Behavioral Sciences, New York: McGraw-Hill.

APPENDIX G

LGA Socio-economic indicator scores

(used to select population)

The Development of the 1984 'Indicator of Disadvantage' and its Application to Resource Allocation Decisions for the Disadvantaged Schools Program in Australia.

Kenneth Ross, Deakin University, July 1984.

LGA SOCIO-ECONOMIC INDICATOR SCORES BASED ON 1981 CD CENSUS DATA('INDEX')
'RANK' = RANK OF LGA BY INDICATOR ACROSS AUSTRALIA
'S_RANK' = RANK OF LGA BY INDICATOR WITHIN THE STATE/TERRITORY
ORDERED BY LGA WITHIN STATES

STATE=ACT

LGA	LGA_NAME	INDEX	RANK	S_RANK	LGA_POPN	NO_CDS	STD_DEV	MIN_CD	MAX_CD
1	ACTON	74.6	1137	80	1498	1	.	74.6	74.6
2	AINLIE	55.1	952	17	4748	9	5.7	47.3	65.2
3	ARANDA	70.2	1125	74	3047	5	4.8	67.2	79.4
4	BARTON	55.8	973	18	713	1	.	55.8	55.8
5	BELCONNEN	52.7	887	9	499	1	.	52.7	52.7
6	BELCONNEN - BALANCE	53.2	906	12	91	1	.	53.2	53.2
7	BRADDON	54.5	940	15	2442	4	9.2	40.4	60.1
8	BRUCE	57.9	1015	25	367	1	.	57.9	57.9
9	CAMPBELL	66.8	1112	66	4214	7	6.9	56.2	76.9
10	CHAPMAN	74.1	1136	79	3536	3	2.0	71.9	75.6
11	CHARNWOOD	54.6	942	16	3479	5	3.3	50.7	58.4
12	CHIFLEY	60.6	1048	37	2901	3	1.2	59.1	61.4
13	CITY	59.6	1033	33	301	1	.	59.6	59.6
14	COOK	68.1	1116	69	3257	5	8.0	62.6	83.7
15	CURTIN	65.2	1104	61	6167	11	3.2	59.7	70.6
16	DEAKIN	71.5	1130	75	2759	5	7.5	63.2	80.6
17	DICKSON	59.1	1028	30	2295	4	4.6	51.3	61.9
18	DOWNER	57.0	999	22	4075	5	1.0	55.8	58.3
19	DUFFY	64.7	1102	59	3855	4	4.1	61.9	70.7
20	EVATT	61.6	1061	39	5791	7	5.0	53.3	67.9
21	FARRER	67.8	1115	68	4066	5	4.5	60.6	72.5
22	FISHER	63.5	1087	53	3779	5	2.9	60.3	68.1
23	FLOREY	64.5	1099	58	284	1	.	64.5	64.5
24	FLYNN	66.0	1108	64	4289	4	4.6	61.8	72.3
25	FORREST	73.6	1135	78	1174	2	7.8	68.9	80.0
26	FRASER	69.5	1122	73	2453	3	3.6	66.6	73.5
27	FYSHWICK	49.6	709	5	80	1	.	49.6	49.6
28	GARRAN	68.4	1118	71	3655	4	5.1	64.1	74.7
29	GIRALANG	62.5	1075	46	3779	4	2.5	60.4	66.0
30	GOWRIE	67.4	1113	67	431	1	.	67.4	67.4
31	GRIFFITH	61.9	1064	41	3025	5	6.0	51.5	66.2
32	GUNGAHLIN	54.5	939	14	95	1	.	54.5	54.5
33	HACKETT	63.0	1082	51	3403	5	4.5	54.8	66.6
34	HALL	60.3	1045	35	2[illegible]	1	.	60.3	60.3
35	HAWKER	72.2	1131	76	3030	5	8.1	56.4	75.9
36	HIGGINS	58.9	1026	28	4013	5	1.8	56.9	61.9
37	HOLDER	64.1	1096	56	3410	4	2.4	62.0	67.7
38	HOLT	59.6	1032	32	4370	5	3.0	57.4	64.7
39	HUGHES	66.6	1110	65	3194	6	5.1	61.0	75.7
41	JERRABOMBERRA	46.5	284	1	776	3	4.5	41.4	50.0
42	JERVIS BAY	47.8	433	3	787	3	16.9	23.0	55.6
43	KALEEN	63.3	1084	52	7471	10	2.9	58.8	67.5
44	KAMBAH	62.3	1069	44	16351	18	4.0	56.9	70.7
45	KINGSTON	50.8	809	6	850	2	14.2	33.6	53.7
46	KOWEN	53.1	905	11	38	1	.	53.1	53.1
47	LATHAM	62.9	1079	48	3424	3	2.2	60.9	65.2
48	LYNEHAM	56.7	991	21	2269	5	5.7	50.9	63.1
49	LYONS	59.3	1030	31	3208	6	10.3	36.7	64.2
50	MCKELLAR	54.1	926	13	34	1	.	54.1	54.1
51	MACGREGOR	62.3	1068	43	4365	5	4.2	58.7	68.8
52	MACQUARIE	62.3	1071	45	2477	3	3.8	58.9	66.1

LGA SOCIO-ECONOMIC INDICATOR SCORES BASED ON 1981 CD CENSUS DATA('INDEX')
'RANK' = RANK OF LGA BY INDICATOR ACROSS AUSTRALIA
'S_RANK' = RANK OF LGA BY INDICATOR WITHIN THE STATE/TERRITORY
ORDERED BY LGA WITHIN STATES

STATE=ACT

LGA	LGA_NAME	INDEX	RANK	S_RANK	LGA_POPN	NO_CDS	STD_DEV	MIN_CD	MAX_CD
53	MAJURA	53.1	901	10	343	2	3.9	51.9	57.5
54	MAWSON	61.9	1065	42	2815	4	7.5	53.4	71.2
55	MELBA	58.6	1023	27	4647	6	19.0	29.0	73.7
57	MONASH	64.3	1098	57	2034	1	.	64.3	64.3
58	NARRABUNDAH	52.0	870	8	5512	8	11.0	35.7	67.1
59	O'CONNOR	58.4	1021	26	5266	10	7.0	44.5	65.8
60	O'MALLEY	77.9	1138	81	105	1	.	77.9	77.9
61	PAGE	59.0	1027	29	2635	3	0.8	58.0	59.5
63	PEARCE	65.4	1105	62	2938	3	6.4	61.1	72.7
64	PHILLIP	68.3	1117	70	355	1	.	68.3	68.3
65	PIALLAGO	56.2	981	19	131	1	.	56.2	56.2
66	RED HILL	68.6	1120	72	3118	5	11.7	49.9	81.1
67	REID	57.0	1000	23	1420	3	13.7	43.0	69.0
68	RIVETT	61.3	1053	38	4100	7	2.7	58.4	66.3
69	SCULLIN	60.4	1046	36	3200	4	1.4	58.5	61.5
70	SPENCE	63.9	1093	55	3321	3	1.6	63.0	65.8
71	STIRLING	62.7	1076	47	1287	1	.	62.7	62.7
72	STROMLO	60.3	1044	34	180	1	.	60.3	60.3
73	SYMONSTON	48.3	520	4	244	1	.	48.3	48.3
74	TORRENS	65.2	1103	60	2627	3	5.2	59.7	69.0
75	TUGGERANONG - BALANCE	56.5	988	20	98	1	.	56.5	56.5
76	TURNER	61.7	1062	40	1968	5	11.4	41.8	69.2
77	WANNIASSA	63.7	1090	54	8742	9	5.7	56.1	73.5
78	WARAMANGA	63.0	1081	50	3138	3	4.4	58.0	66.1
79	WATSON	57.9	1014	24	4085	6	3.0	55.2	63.9
80	WEETANGERA	73.1	1133	77	3304	4	2.7	69.9	76.5
81	WESTON	65.4	1106	63	3739	6	4.9	60.5	73.0
82	WESTON CREEK - BALANCE	47.0	352	2	95	1	.	47.0	47.0
83	YARRALUMLA	62.9	1080	49	2882	5	4.1	59.5	70.1
84	ACT - REMAINDER	51.3	846	7	378	3	10.8	43.6	65.3

Source: The Australian Department of Education, A.C.T.