STIMULUS, EFFECTS ATTENTION AND READING PERFORMANCE

A thesis presented in partial fulfilment of the requirements for the degree of Master of Arts in Applied Psychology at Massey University.

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1976

ABSTRACT

This investigation reports an experimental study on the effects different stimulus characteristics have on attention and subsequent reading performance with "good" and "poor" readers.

Forty subjects between the ages of eleven and eleven and a half years at the time of the study (November, 1975) were selected from a typical city school on the following criteria:

(i) All subjects had to score within ± 1 standard deviation of the mean on the "Henmon-Nelson Tests of Mental Ability" Group 6-9, Form A. (H.N.)

(ii) Twenty of them (ten boys, ten girls) had to score between 20-30 raw score points on the "Progressive Achievement Test: Reading Comprehension" and have a Teacher rating of 3+ or 2.

(iii) Twenty of them (ten boys, ten girls) had to score 18 or less raw score points on the "Progressive Achievement Test: Reading Comprehension" and have a Teacher rating of 3- or 4.

These two groups were then referred to respectively as "good" and "poor" readers. Intelligence was being held constant to prevent it being an independent variable in this study.

All forty subjects were tested on the "Concealed Figures Test" (C.F.T.) which was used in the study as a measure of "attentional style".

Each subject was then presented with a series of slides and his responses recorded. In the first instance six slides, containing three real and three novel animals, were presented in a typical setting. Each slide had a coloured border surrounding it. After viewing each slide (their viewing time being recorded) they were asked to select from two multiple choice questions the setting in which the animal appeared and the colour of the border. This was repeated with the same animals in atypical settings and different coloured borders. Responses to the setting were recorded as "intentional" learning while the border colour was termed "incidental learning".

Each subject was then presented with a slide containing a "mutilated" text (where the first letter of each word had been changed) on each of the animals viewed previously. Each text was presented three times - with a picture, without a picture, without a picture but surrounded by a coloured border. The "on task" time and number of word errors was recorded for each presentation.

The same procedure was repeated only with a different six animals as the subjects for the text (again comprising of three novel and three real animals). "On task" time and word errors were again recorded.

Finally, five slides about one novel and four real animals were presented in traditional orthography as a control measure. These were presented as text only, text and picture, text and border, text and picture and border.

On analysis of the data it was found that "incidental" learning was no greater with bright coloured borders than it was

with dull coloured borders.

"Intentional" learning too was tested out not significantly different with novel animals or settings than it was with real animals or typical settings.

On the "attentional style" test boys were found to have significantly less errors than girls ($p < .005$). However, predicted differences in the number correct between boys and girls, "good" and "poor" readers showed no significance on a one tailed t-test.

The "on task" time of high scorers on the C.F.T. as compared with low scorers did not differ significantly in the reading of the "mutilated" texts.

"Good" readers though spent less time "on task" when the text was presented with a picture than did "poor" readers ($p < .05$). The same significant difference existed when they were presented with a text only. However, no difference was found when they were presented with a text surrounded with a coloured border.

Reading performance of "poor" readers was increased when presented with a text only as compared with a text and illustration ($p < .10$). A one tailed t-test also showed a significant improvement in the performance of "poor" readers when the text had a coloured border around it ($p < .05$). The bright colours showed a very significant improvement in reading performance of "poor" readers as compared with the text only ($p < .005$).

Stimulus materials such as texts with a coloured border seem to assist "poor" readers in particular into focusing their attention on to the relevant cues and increase their success in reading.

ACKNOWLEDGEMENTS

I should like to acknowledge with gratitude the assistance given me by many people during the course of this study.

In particular, I would thank the following:

The Principal, staff and children of the school co-operating in the experiment and its preparatory phases;

Mr B.V. Gaylard, Senior Teacher, Monrad Intermediate School;

Mr E.L. Archer, Senior Lecturer, Education, Massey University as supervisor and guide;

Several staff colleagues of Palmerston North Teachers College for advice, encouragement and minor assistance;

Mr A. Pegler, Palmerston North Teachers College for the preparation of the slides;

Professor C. Hill and G. Shouksmith, Massey University;

Dr M. Pianka for his guidance, assistance and encouragement;

Mrs D. Collins, Palmerston North Teachers College for typing of stimulus material;

Mrs H. Hayward for typing this thesis;

and finally,

My wife and family for their encouragement and tolerance during this period.

G.C. McRae

Palmerston North
23 March, 1976

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CHAPTER I

THE RESEARCH ISSUE

INTRODUCTION

The investigation reports an experimental study of the relationship between selected stimulus material and its attention raising properties in relation to the learning outcome measured by reading performance.

The attention variable was assumed to be an individual difference factor, varying levels of which would produce differential responses relative to the presentation of the selected visual stimuli. Because such a reaction may be influenced by intelligence it was held as a constant.

A measure of "attentional style" was employed to enable the relationship between this, the stimuli and reading performance to be explored.

From existing research the expectation was that there would be differences between individuals in their response to the stimuli because of "attentional style" and whether they were male or female.

A further expectation was that stimulus materials which gained greater levels of attention would also lead to improved levels of reading performance with both "good" and "poor" readers as well as male and female.

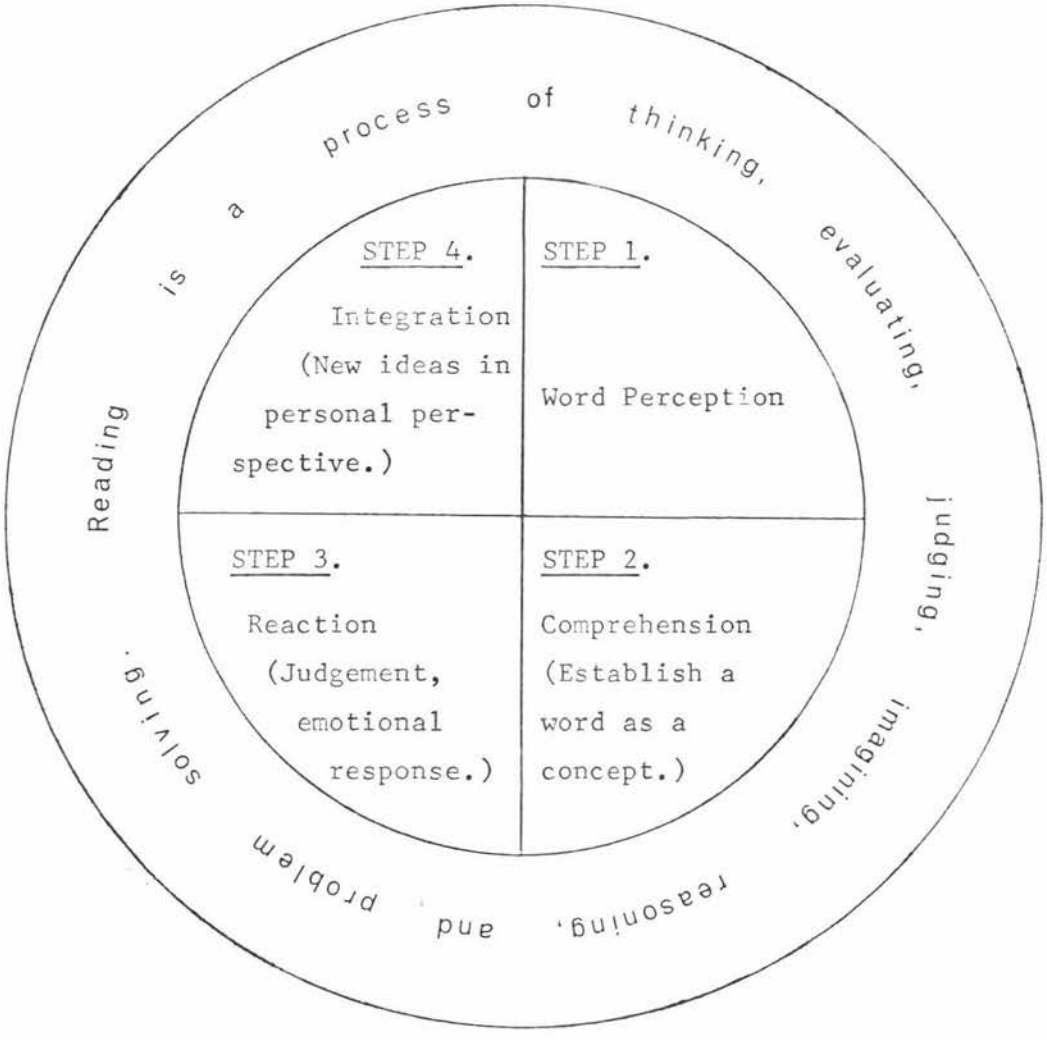
REASONS FOR THE STUDY OF THE PROBLEM

Throughout many countries of the world, and in particular New Zealand, there seems to be an evergrowing percentage of the school aged population experiencing difficulty and consequently low levels of achievement, in learning to read. These children provide a large percentage of early school dropouts. In turn this has an effect on the composition of our society. Positions requiring a reasonable level of scholastic performance either remain unfilled or are filled by individuals of sub-scholastic standard. On the other hand the unskilled and semi-skilled positions are able to be more selective in their choice because of the large numbers wanting such jobs. Such a problem is not unique to New Zealand, of course, other English speaking countries such as the U.S.A., Britain, and Australia are experiencing a similar situation and have been conscious of it for a greater duration than New Zealand.

To combat an ever increasing problem as this, in the last half century, and in particular since World War II, a tremendous amount of literature both theory and research has been published in the field of reading. One such publication which helped lead teachers into a better understanding of the complex process of learning to read, was that published by Gray (1948).

Gray conceptualised the nature of reading as a four step process which highlighted the complexity of the process in terms of physiological, sensory, cognitive, cultural and environmental factors on which learning to read is dependent. Up until this era learning to read had been looked upon as a natural developmental process like walking and talking.

Gray's conceptualisation of the process of learning to read can be illustrated by the following diagram:



Previous and subsequent attempts to describe the reading process, although in some cases superficially different, can, on analysis be seen to fit into one or more of the steps outlined above. The difference being mainly in emphasis as may be illustrated by the linguistic view put forward by Goodman (1972) where his emphasis lies in steps 2. and 3.

A more recent look at the reading process, which summarises most of the successful literature in this topic, was published by Spache and Spache (1964). They saw it as involving skill development, a visual act, a perceptual act, as reflection of cultural background, a thinking process, information processing and associational learning. A very comprehensive coverage, but by no means does it deny Gray's model. The areas mentioned by Spache and Spache fit into one or more of Gray's four step process, and indeed, in his book he deals with these when he expands in detail each of the four steps.

The first step, that of word perception, which incorporates a visual act, is the "launching pad" for the reading act. As visual perception of words is the "launching pad" to reading a cursory glance at perception is less than adequate. Early writings in this field, in particular, the period from 1850-1920, like those of Sir William Hamilton (1859), G. E. Miller (1873), Lange (1888) and others used the concept of "attention" as playing a major role in the psychology of perception. For a period of time following this, publications in the area of attention differed only in terminology rather than the phenomenon being described.

Recent writings in the field of perception, such as Bruner (1966) describe it as "the individuals attempts to make the sensory inputs meaningful". He views also perception, concept formation and category formation as very closely related. Ausubel (1969) another cognitive theorist, sees perception being facilitated through capturing the individuals interest and ensuring that they are attending.

The process of learning seems to involve the following: sensory stimuli, sensation, perception, concept formation and cognition, in that order. Perception being an integral part of learning and the "launching pad" to reading. It is surprising that the literature published on reading shows a glaring omission in that most of the texts do not include learning theories and relate them to the reading process.

The relationship of learning theories to reading is referred to in some recent texts as "The Psychological Foundations of Reading Instruction" and has occurred in only a small number of books written and published since 1970.

Hilgard (1966) suggests that theories of learning might be expected to answer questions one might ask about learning in everyday life. Any theory then, according to Hilgard may be appraised in terms of its attention to measuring:

- capacity
- practice
- motivation
- understanding
- transfer
- forgetting

all of these factors are important in the learning to read act. Two in particular though, stand out as factors which are extremely important and require further analysis; namely, motivation and understanding.

Motivation, for example, has an arousal and directional component in it and is also seen as a major factor influencing perception. Understanding, on the other hand is dependent upon

the individual being motivated which will facilitate perception: a necessary forerunner to understanding.

Theories of motivation such as those put forward by Hull (1943), Murray (1938), Maslow (1954), McClelland (1953), as need theorists; Festinger (1957) on cognitive dissonance; Piaget (1938) on equilibration; Bruner (1966) on curiosity and competence; Berlyne (1960) on arousal, have a common underpinning of stimuli from one source or another (i.e. internal or external) causing the organism to be thrown out of its state of biological, physiological, emotional or cognitive balance. Further the assumption being that when the organism is aroused, there is a natural reaction on its part to seek a new state of equilibrium.

However, the human organism is being bombarded with stimuli continuously, some of which are above the lower threshold for sensation and thus have the necessary properties to bring about this state of arousal and the concomittant of a drive for equilibrium.

It seems then to be of educational worth to investigate the nature of stimuli presented in learning situations, such as reading, which will have a greater chance of arousing the organism to indulge in exploratory but selective type behaviour to achieve a new state of equilibrium. There is a great deal of literature published about stimulus characteristics and their ability to arouse the organism to a state where it selects from the cues available to overcome any ambiguities of the environment. Such literature discusses this property of stimuli and the organism reaction under the concept of "attention"; the most significant publication being that edited by Mostofsky (1970), where significant

findings on "attention" in the last two decades are discussed.

As far back as William James (1890), the concept of "attention" has been known but to a large extent has been included in terms such as motivation and perception.

A greater contribution to teacher knowledge would be the results of research which has been focused around the relationship of stimuli to attention and the similar relationship of attention to learning.

NATURE OF THE PROBLEM

If reading performance is to be improved, effective research needs to be carried out on the variables which have an inhibiting or facilitating effect on the learning to read process. Improved performance in reading does not envisage a shift for all to the top of the achievement scale: a more realistic view than this is held. Instead, it envisages providing for the individual to maximise his learning in terms of his abilities. A goal such as this can only occur once those involved in "educating" gain an increased knowledge of the differential ways in which learning may be facilitated according to the individual's particular learning "style".

In the past a great deal of work has been done in the area of "cognitive styles", e.g. Witkin (1954), Kagan (1965), Wallach and Kagan (1965), Hudson (1966) to mention only some of the more prominent in this field. Research and theory of this nature has provided much valuable information for teachers. Nevertheless, knowing an individual's cognitive style does not ensure an increase in learning. In fact referring to "cognitive style" infers that there is a degree of understanding already taken place to enable cognition to occur. Yet looking at the field of reading, concern must be given to the earlier stages which will ensure the occurrence of cognition.

Focus then needs to be on perception, previously seen as the "launching pad" for the reading process. There is no denial that "cognitive styles" have some influence on the learner in respect to how he thinks his way through a problem but some styles identified such as field dependent - field independent, (Witkin, 1954).

Levellers - Sharpners (Kagan, 1965) seem to be looking at the stimulus, its nature and context.

Cognitive styles seem then to fall into two major categories:

(i) those focusing on the thinking strategies used by individuals in problem solving situations e.g. impulsivity-reflectivity (Kagan 1965).

(ii) those focusing on the selection strategies used by individuals during the initial contact with stimuli.

It is the latter of these two which is a part of the perceptual process and important in the act of reading. Such styles, because the individual is aroused by certain stimuli and commences selecting among the stimuli in the field, yet ignoring others, may be referred to as "attentional styles".

In a recent study by Denney (1974) "attentional style" (as measured by the "Fruit Distraction Test") was found to be more effective in differentiating between poor and good readers than the measures of cognitive style used by him. An indication from this study is that knowledge of "attentional styles" may be of considerable value to teachers in helping them facilitate and enhance reading performance especially of poorer readers.

GENERAL RESEARCH QUESTION

A major consequential problem then, is to investigate those stimulus characteristics which may have differential effects on the gaining of attention with individuals. Assuming such differential effects, a related task problem is both the incidental and intentional learning outcomes.

For any study in this field, variables such as age, intelligence and sex all need to be controlled as previous studies have shown that all three operate some control over attending behaviour: c.f. Zeamann-House (1963), Silverman (1967), Harper and Graham (1974), Mostofsky (1965).

In this particular study as the focus is on reading performance some classification and control of levels of reading achievement would be necessary. That is, classification would be necessary in two distinct groups such as below average, or average to above to enable the effects of stimulus material and the related task problem of incidental and intentional learning to be measured.

With such classification it would then be possible to determine whether or not there is a difference in the "attentional styles" of the two groups. In addition the differential means of stimulus presentation, and their effects on reading performance could also be measured.

The question then to be researched in this study may be stated as follows:

"Do stimuli effect attention and reading performance?"

EDUCATIONAL SIGNIFICANCE

Children passing through the educational system in New Zealand are presented with printed material in ever increasing amounts, all of which is of a similar format. For example, in the beginning stages of learning to read children are exposed to the "Ready to Read" series published by the Education Department. In addition to the "Ready to Read" series many supplementary books are available, published by independent publishers to parallel each stage in the Education Department's series. However, the basic series and published supplementaries are of a very similar format, especially in the beginning stages, with a picture on one page and a brief text on the adjacent page. Books at subsequent levels only differ in that the number of illustrations reduce and the amount of text increases. In spite of what is available a large number of children still have difficulty, or experience complete failure in learning to read. Because a large number do learn to read successfully the basic materials used, along with the teaching strategies, would seem to be appropriate for these children. However, those who experience failure or difficulties of some sort, scrutiny of both the materials and teaching strategies is necessary.

It is the purpose of this study to focus on the former of these in terms of their classification as stimulus materials.

The results of such a study may have implications not only for publishers but also and most certainly for the teacher of reading.

The latter is of major concern, in particular the guidance it may provide for assisting poorer readers.

CHAPTER II

REVIEW OF LITERATURE

William James (1890) considered the immediate effects of attention to be, to make the individual

(i) perceive

(ii) conceive

(iii) distinguish

(iv) remember

His position is consonant with much of the work carried out in the field of perception, especially that which was done in the late 19th and early 20th century (referred to in Chapter I of this study). Attention is regarded as being a necessary and all important aspect of perception.

Such definitions of attention as the following help to illustrate this link with perception:

Titchener (1908) described attention as "a state of sensory clearness with a margin and a focus", a view which accords with the Gestaltist figure-ground explanation of perception.

Chaplin (1968) defines attention as "the process of preferentially responding to a stimulus or a range of stimuli. Involved in this is the adjustment of the sense organs and central nervous system for maximal stimulation."

Norman (1969) influenced greatly by William James describes it as "the taking possession by the mind, in clear and vivid form, of one out of what seems several simultaneously possible objects or trains of thought."

Each of these writers seems to regard focalisation and concentration to be of its essence. Each appears to hold a position which implies that in attending there is withdrawal from some things in order to deal effectively with others. Indeed, the three definitions listed above reveal one other basic similarity in viewpoint. Each refers to an initial orienting of the organism to the stimuli, followed by a selection and processing of only some of these stimuli. The initial response referred to is known in literature on attention as the "orienting response or reflex". It involves the organism being alerted, aroused to undertake the processing of particular stimuli, which it considers appropriate from the many available. Berlyne (1960) referred to a very similar reaction as the orienting response in his "Arousal Theory" which he saw as an explanation for motivation. Boiko (1965) warns that the orienting reflex should not be confused with other special defensive reflexes. As originally formulated the orienting reflex was regarded as a "What is it?" reflex, and was assumed to perform a particular function quite distinct from other available reflexes which seem to be more associated with "flight" or "fright" reactions. Let it be sufficient to say that there is something in the nature of the stimuli which arouses or alerts the organism to a state where it focuses, for some reason or other, on some stimuli and not on others.

Carkhuff (1972) in his book "The Art of Helping" sees attending as an all important factor in psychotherapy. Although his description of what constitutes attending emphasises eye contact and body positioning, he also gives equal weight to listening and observing in preparation for responding. The orienting reflex then is not just a matter of positioning but also involves the alert-

ing of the organism to indulge in some form of stimuli scanning.

It is interesting to note that the word arousal has been used as a synonym for attention since the notion of psychophysiological dimension of arousal (Hebb 1955, Malmo 1957, Berlyne 1960, Duffy 1962) has come to attract wide interest. The reasons for linking these two are based on various indices of increased arousal, and especially E.E.G. alpha blocking, called forth by stimuli that one would expect to capture a subject's attention. Then an increase in arousal, and especially the transient rise in arousal that forms part of the orienting reflex (Sokolov 1958, Berlyne 1960), appears to entail physicochemical changes in sense organs and in sensory structures of the nervous system, changes that heighten their ability to take in and process information. At the same time, the ability of associative mechanisms in the central nervous system to analyse and utilise incoming information is heightened. Similarly many writers have postulated that a rise in drive (arousal, emotion) leads to a narrowing of "cue utilization" (Callaway & Stone, 1960; Easterbrook, 1959).

This latter statement focuses on a crucial characteristic of attending behaviour, that is, its tendency to be a selective process. The individual appears to attend to some stimuli in preference to others.

Gibson (1969) argues, "Children and adults can take in only a limited amount of information at any one time, and therefore, attend only to some aspects of what is going on around them and not to others. We select what we attend to in a systematic way, attending to particular dimensions and distinctive features. Generally the individual chooses which dimensions to ignore and

which to attend to in a rational manner."

Kahneman (1973) stated that low arousal produced low selectivity but as arousal increased selectivity increased and performance improved because irrelevant cues were more likely to be rejected. Bahrick, Fitts, Rankin (1952) had subjects engaged in two tasks:

(i) The continuous tracing of a target.

(ii) Monitoring the occurrence of an occasional figure in the visual periphery.

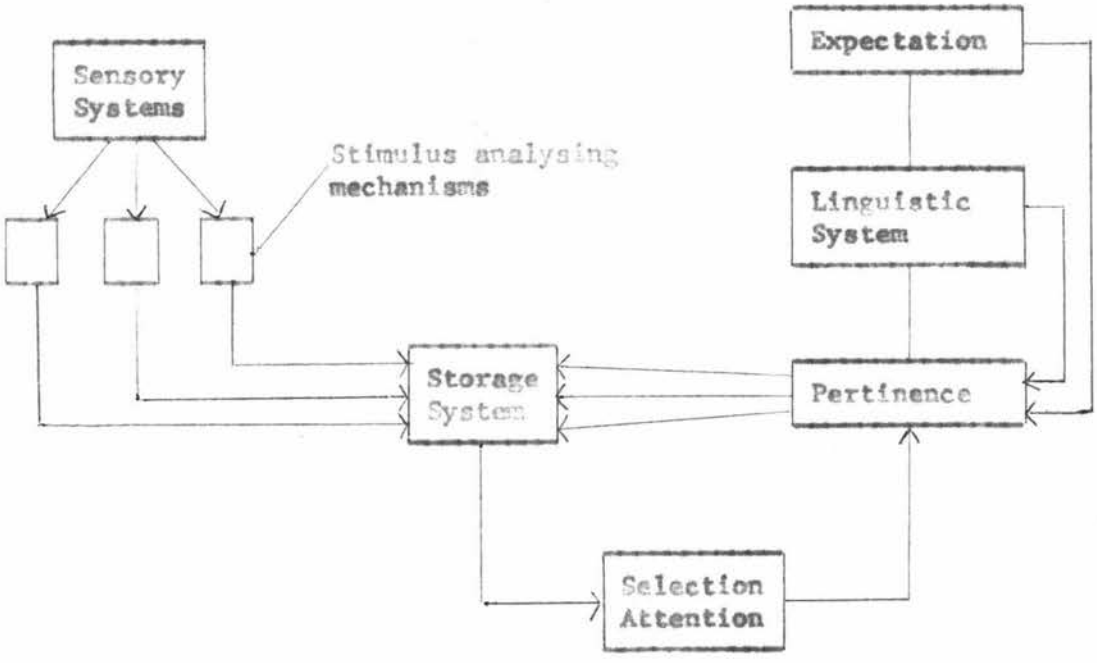
When incentive pay for both tasks was increased from 20 cents to a dollar the performance on the central task improved and the peripheral task deteriorated.

Callaway and Stone (1960) also found that a decrease in arousal improved the registration of peripheral cues.

Theorists of attention, have tried to explain the total process but with only a modicum of success. One of the first attempts was put forward by Broadbent (1958) in his "Filter Theory of Attention". He postulated the idea of a filter system which had the capacity to select only one of the input lines and give it direct access to the "limited capacity channel" which reacted with long term memory and then on to output mechanisms. However, work done by Deutsch and Deutsch (1963), Triesman (1967) and Neisser (1967) have all shown the inadequacies of this theory.

Norman (1969) suggested a model based on the theories of Deutsch and Deutsch (1963), Neisser (1967) and Triesman (1967) as an alternative approach to explain this complex process. The important additions by Norman, to theories by Broadbent, Neisser and Triesman are the influence of "expectations", "linguistic systems" and "pertinence" on gaining and sustaining attention.

Diagrammatically then this model is represented below:-



After the orienting reflex, which appears to heighten the sensitivity of the sensory system and arouse the organism to be selective (or even force it to be selective because of a narrowing in focus due to the initial interpretation of the arousal stimuli) selective attention according to Norman, is guided by the individual's expectations, predictions, the availability of language to assist in interpretation and the individual's decision on relevance of particular cues based on previous experiences.

With reference to the reading process, expectation, pertinence, and linguistic systems are determinants in the act of successful reading. Expectation, pertinence and linguistic systems are learned, highlighting that attention is also learned. The young child like many animals is stimulus bound and reacts to stimuli which impinge upon it (Mostofsky, 1970). With humans, as with animals, to a lesser degree, experience or learning helps them to know which stimuli to attend to in familiar situations.

There are children though, through a maturational lag of some sort, limited experiences, low intelligence or interrupted learning, whose development in learning to attend to relevant cues varies from one to the other considerably. The Zeaman-House (1963) study supports such a statement by postulating an attention-deficit theory to account for the impaired learning characteristics of retardates. They in fact found that retardates when shown what to attend to, developed learning curves approximating those of "normal" learners. Although a certain circularity in their argument has been pointed out by Wischener (1967), there appears to be much of value in their discovery of differences in "on task" time between the two categories of learners, and the reduction of this by retardates when they learn or are directed towards relevant cues for attending.

It would be interesting to know whether or not these subjects had an attentional deficit because of their intellectual level or an attitude built up through continual failure. To shed some light on this Zahaderne (1958) carried out a study with sixth graders on attitudinal and intellectual correlates of attention.

Four sixth grade classrooms totalling one hundred and twenty-five children were used to determine whether attentiveness in class was related to attitude towards school on one hand or achievement and ability on the other. Each pupil's attention as defined by "on task" time, to the main class activity was recorded over a two month period using a modified version of the Jackson-Hudgins (1965) Observation Schedule. In addition questionnaires assessing the attitudes were administered, and I.Q. and

achievement-test scores were obtained from school records. There was practically no relation between students' attitudes and measures of attention; however, a positive relationship was found between measures of students' attention and scores on achievement and intelligence tests. In sum, all of the pupils in a classroom may have been subjected to the pressures for attention but the extent to which they responded appears tied to a general ability variable rather than to an attitudinal one. The question then arises, if intellect is an independent variable and attitude has little or no influence then what is the important variable?

In an attempt to answer this Kahneman (1973) states that the effort anyone investscorresponds to what he is doing rather than what is happening to him. Further, he sees that voluntary attention is exertion of effort selected by current plans and intentions while involuntary is exertion of effort which is selected by more enduring dispositions. In addition, mental effort is reflected in manifestations of arousal shown by such physiological indices as pupil dilation and electrodermal response. The individual then is likely to put in mental effort when he knows what he is doing and thus attend, as he does when it is something learned such as the sound of a siren or father's voice and the like.

Bruner (1966) supports this notion of effort and voluntary attention put forward by Kahneman when he discusses his notion of "cognitive cost". In this situation an individual in a problem solving situation adopts a gambling strategy rather than a logical strategy to attempt a solution, because the cognitive

cost of the logical strategy is too great. Such a strategy then determines the cues to which an individual will attend. To relate to a reading situation where a poor reader is confronted with a difficult word the cost of laboriously working it out by using techniques of phonic and structural analysis, context, configuration may be much greater than the possible pay-off. In such a case the individual is likely to adopt the gambling strategy and attend to a minimal cue such as configuration and initial consonant, and then make his guess accordingly.

Selective attention, however, is close to what is being talked about in discrimination learning - this is learning in which the task is to make choices or judgements between alternatives. Discrimination learning is basic to the act of reading. Correct discriminations can only be made if the left to right eye movement has been mastered by the individual. The development of this will be dependent upon correct cue responses and reinforcement. In the beginning stages of training reinforcement would need to be given by another adult such as the teacher, but in latter stages of development will be self-administered through correct left to right eye movement and subsequent success in the reading act. Although left to right eye movement is necessary, it is not on its own all that is required to deal with the discriminations and responses to the necessary cues required for accurate reading. But this ensurance that cues are responded to in the correct order is a necessary forerunner to effective reading.

In the early stages of learning to read when cues are responded to correctly reinforcement is administered. This reinforcement is to word shape, left to right eye movement, picture

clues and possibly contextual clues. As the individual develops in reading correct responses become self-reinforcing. In itself this tends to bring acts such as left to right eye movement, use of configuration, contextual clues and initial consonants to the state of being habituated responses. Staats has discussed this matter to some length and suggests that the pre-school reinforcing and non-reinforcing experiences are the main determinant of early attention development. Those children who have not learned appropriate attending behaviour tend to exhibit a failure syndrome in their first year of schooling. The non-achievement symptons of this syndrome are amply demonstrated by Clay (1972) who reports extensively on typical reading problems found in six year old children (after one year at school in New Zealand).

If reading development is dependent upon "attention" or "attending behaviour" and such behaviour is learned, which entails the selection and processing of relevant cues then it is necessary to examine the cues important for effective and successful reading performance.

As a child progresses in his performance in reading, on analysis it may be found that he has acquired many more skills than he initially possessed. This would be true in analysing any subsequent level in reading and comparing it with an earlier level. With advancing reading skills then, he is learning the relevant cues to which to attend. But advancement in skills does not mean emphasis is to be placed on the important word recognition skills alone. Advancement in reading through attending to relevant cues includes the learning of all skills such as prediction and discrimination in meaning for fulfilment of the total reading process,

and meaning and reaction being attached to the printed symbols. The printed symbols themselves have only, in Ausubel's terms, potential meaning the "real" meaning being within the reader's cognitive structures. However, "real" meaning cannot be achieved unless the available cues are attended to in their correct order (as far as phonic and structural analysis of the word) and the familiarity of language patterns for meaning.

Sheldon (1955) defines the reading process as one of skill development which passes through seven major stages. These include the building up of concepts and simple language patterns, the individual reading his own language patterns, reliance on picture clues and the acquisition of a sight vocabulary which is dependent upon language patterns, configuration and distinctive features. Following on from this is the discrimination by initial consonants and blends, word endings and other phonic and structural details. After this the individual seems to broaden his vocabulary and knowledge of language patterns before meeting technical vocabulary and concepts and again different language patterns such as the language of science.

An aid to the individual for assistance in responding correctly to language patterns is thought to be the parallel association of picture and text, as advocated by Richardson and Hart (1959) in their appraisal of books suitable for teaching retarded readers. Attention, and processes related to information intake, are regulated to some degree by the amount of available information. Therefore, in pictures or illustrations provided to aid the response to the text isolation of the important features either by omitting or fading out the background, or by the use of

bright colours, or provision of sketches with some novelty about them (Travers, 1972, pp. 23 -241) has been found to be effective in getting the reader to attend to relevant cues designed to aid their response to the printed text. Gattegno (1962) also found that the use of colour backgrounds, of different shapes, assisted greatly in the discrimination of letters and combinations of letters. Travers (1970) reviews some of the literature supporting intense stimuli such as bright colours as attention gaining. Travers (1972) also outlines some of the literature supporting novelty as a factor in gaining attention. Bird, Scanlon and Hart (1968) in their series of "Trend Books" for older retarded readers have capitalised on novelty, fading into background or omission of unimportant details and colour which too are associated step by step with the text, in their sketches to aid the reader to respond, with a greater chance of success, to the printed text.

Gattegno's (1962) work "Words in Colour" has been tried and tested with children in reading having discrimination learning problems and has been found to be successful with many.

Samuels, S.J. (1967) in an experimental study looked at the effect of pictures on the acquisition of reading responses. In his first experiment he used thirty pre-first grade children and randomly assigned them to one of three experimental treatments - no-picture, simple-picture, and complex-picture conditions. During acquisition trials, when pictures were present, the simple and complex picture groups made more correct responses ($p < .01$). During the ten critical test trials, with no pictures present, the no-picture group excelled ($p < .01$). Thus support was given their

hypothesis that "the presence of pictures would retard the acquisition of reading responses". From this experiment, it would appear that pictures functioned as distracting stimuli in that they drew attention away from the printed words. Braun (1967) also found significant differences in reading acquisition favouring the no-picture group. Samuels (1967) in his second experiment used twenty-six pairs of matched first graders who were given classroom reading instruction under a no-picture or picture condition. The results disclosed that poor readers with no picture present learned more words ($p < .01$). With those classified as better readers the difference was not significant. These results concur with the findings of Silverman, Davids & Andrews (1963) and also Baker & Madell (1965) in that performance of less capable students was affected more by distracting stimuli than was the performance of the more capable students. Mather (1969) also found in the teaching of social studies, concepts pictures showed themselves to be more distracting in nature than facilitators of specific learning. Such studies do not answer all of the questions but nevertheless do support the conjecture earlier in this chapter that with increasing skills children have learned the relevant cues to which to attend. However, the value of pictures for motivation, their influence on student attitude and the use good readers make of them when they are available are left unexamined. There is also no mention of the quality of the pictures in terms of the use of bright colours and novelty which may have contributed to them being strong distractors to the text.

Paradowski (1967) carried out a study on the effects of

curiosity on incidental learning. A definition of curiosity accepted by Paradowski for this study came from Maw & Maw (1962):

> "... curiosity is a condition whereby an individual becomes more sensitive to cues in his environment"

which is very close to the explanations in the literature on selective attention.

With fifty-two undergraduate subjects, curiosity was aroused by the presentation of five illustrations of strange-looking animals. Five additional illustrations of familiar animals were shown to the same subjects to produce the effects of low arousal. Paragraphs of verbal information were paired with each illustration and provided an intentional learning task. Intentional learning was assessed for each item as was incidental learning, which consisted of the post-test recall of the settings and border colours around each animal illustration. Curiosity arousal, stimulated by the pictures of novel animals, significantly increased both intentional and incidental learning. This finding is at sharp variance with the generalization based on research on aversive drive states that drive arousal leads to reduced incidental learning.

Paradowski puts forward an explanation that the effects of arousal on incidental learning are dependent upon the nature of the drive aroused. Woodsworth (1958) supports this notion when he stated:

> "Arousal of need primacy motives decreases incidental learning, whereas arousal of behaviour primacy motives facilitates incidental learning."

Although Paradowski did not employ both novelty and colour borders in his written texts such a notion has some merit. The use of coloured borders of high spectrum loci around texts about both novel and familiar animals, and the association of novel pictures with texts needs researching as to their influence on reading performance. Although the work by Samuel mentioned earlier would indicate that both novel and familiar pictures may impair performance in reading the texts, these almost universals of attention - novelty, bright colours, and complexity may well show themselves to be effective in increasing reading performance of texts without accompanying pictures.

Rayner and Kaiser (1975) looked at the effects of novel texts on good and poor readers when asked to read mutilated texts. Twenty-four subjects in all were used - twelve from Grade Six, all considered good readers, and twelve from Junior High School, all of whom were considered poor readers. The texts were mutilated by changing the shape of the words and/or the initial, medial or final letter. When the shape had been maintained by replacing letters with letters that shared distinctive features, and were visually confusable with them, less reading time was taken and fewer errors were made than when the shape had been altered by replacing letters with letters that were not visually confusable with them. In addition mutilations to the beginning of a word were considerably more disruptive than mutilations to the middle or end of a word. Good readers and poor readers showed highly similar data patterns. It was noted in particular for poor readers that conditions in which more of the distinctive features of the words were preserved facilitated reading. One possible

interpretation of the study is that Mayner and Kaiser have introduced elements of complexity and novelty into the written text. These elements may have assisted subjects in their attending behaviour so that they scanned more carefully for relevant cues. Therefore, a combination of the coloured borders and novel pictures as used by Paradowski, with mutilated texts may well bring out some of the distinctive strategies used by good and poor readers in attending to the texts along with the consequent reading performances in the differential conditions.

Marchbanks and Levin (1965) investigated the cues by which children recognize words. With a sample of fifty kindergarten and fifty first grade children they aimed to investigate the bases on which children recognize words.

Subjects were required to select from a group of pseudo words the one similar to a word that had just been exposed to them. Each word in the response group contained one cue that was the same as the stimulus word, with the other cues held constant. Specific letters, and not the overall shape of the words, form the basis for recognition according to their results. The first letter is the most important cue; the final letter is the second most important. In three letter words the last letter is a more salient cue than in five letter words.

An explanation of the "first-last" letter phenomenon may lie in the theory of primacy and/or recency of cues. Or, perhaps, the first and last letters of a word stand out in particular because they are isolated on one side by a white space, whereas middle letters are embedded in other letters. (Marchbanks

and Levin, 1965). Bryant (1974) suggests that in reading, children are responding as much to the background as they are to the foreground. If this is indeed so it is likely that the first and last letters, where a greater contrast exists between background and foreground, would be attended to more than other letters in a word. It also suggests a reason for attention to medial letters which protrude into the background because of their size, e.g. the "th" in "either".

There is considerable agreement on the importance of the first letter as an important cue, in the studies of Marchbanks and Levin (1965), and Rayner and Kaiser (1975), but disagreement about the importance of the outline shape of the word. Amongst the reasons for such difference in findings may be suggested:

(i) Marchbanks and Levin used words up to five letters in length with the majority being three letter words to match the limited vocabulary of their young subjects.

(ii) Rayner and Kaiser used subjects of eleven years of age and older who had had at least six additional years of instruction in reading. Their subjects would have larger vocabularies including many words greater in length than five letters.

Thus age, increased vocabularies, and knowledge of more relevant

cues to which to attend for the successful unlocking of a word may explain the difference in their findings. One very interesting difference is that Marchbanks and Levin used twenty-five boys and twenty-five girls as subjects. Differences in results between the sexes were recorded and discussed, although their final conclusions are based on an average from the group of fifty. Rayner and Kaiser on the other hand do not say whether or not their subjects are boys, girls or a combination. Results, therefore, may be influenced by the variable sex.

Mostofsky (1970, pp. 80-81) in his book, discusses to some extent the studies that have looked at sex differences in attentional styles and concludes:

> "... sex differences in attentional responses are found very early in life, and that they accord with the Eros-Logos theoretical distinctions of Jung and Wickes. Female infants also appear disposed to respond to patterned stimulations which are complex; males appear to 'prefer' stimulus patterns which are more amenable to analysis and compartmentalization. These response differences are consistant with those observed later in life; they also are associated later in life with differences in responsiveness to inner stimulation. Older females are more prone than older males to phantasy and to react to situations on the basis of emotional cues (Casteneda and McCandless, 1956; Goldstein, 1959; Trumball, 1953). Finally, females of all ages appear to evidence a

greater responsiveness than males to social stimuli."

Harper and Graham (1974) found with forty, six year olds, in two New Zealand schools that the boy/girl attending behaviour difference parallels a finding common to many English speaking countries, that is, girls are generally better readers than boys. (Dwyer, 1973). Samuels and Turnure (1974) using eighty-eight, six year olds in Minneapolis, also showed a difference in attention favouring girls. They also computed a Pearson product-moment correlation between word recognition and attention of .44 ($p < .01$). The similarity of the results of this study with those of Harper and Graham indicate both a measure of generalizability and also tend to emphasise further the importance of attending behaviour in the learning to read.

Other studies on the difference of attention between boys and girls show that girls have significantly higher performances than boys. However, this sex difference diminishes with age and ceases to be significant between eight and eleven years, but becomes significant again at twelve years of age. (Gale and Lynn, 1972).

A major difficulty with any research in the field of attention is choosing an instrument which will provide some index of "attentional styles". In addition to, or instead of, some measure of attentional style some means of objectively determining when children are attending is necessary. But again such a means is difficult to obtain. The latter may be achieved by using measures of physiological changes such as those measured by the

Galvanic Skin Response (G.S.R.), pupil dilation, cardio-vascular and respiratory changes. Attempts to measure G.S.R. or cardiovascular and respiratory changes introduce the possibility of intervening variables which are likely to produce confounded results. Some classroom activities, would not permit attachment of sophisticated instruments to children.

Nevertheless, in studies concerning children's reading it is possible to have some objective measures of when they are attending through the measurement of pupil dilation by the use of an eye camera or a videotape recording from a camera mounted facing the subject and focused on his eyes. A further index may also be achieved by a measure of "on task" time.

Harper and Graham (1974) for example, observed children in the classroom and noted the time that, in their opinion, these children were involved and working on the task set by the teacher. Other studies, some of which have been mentioned in this chapter have used similar observation techniques to calculate an index of attention derived from the time noted that the subject appeared to be "on task". With many classroom tasks, however, it is difficult to be sure whether or not an individual is attending solely from outward appearances. Expository type lessons involving a certain amount of pupil time sitting, listening and supposedly assimilating can be very misleading. Body orientation and eye focus on the speaker does not necessarily indicate what cognitive activity is occurring.

Instruments for measuring "attentional style" are not numerous. However, tests such as the "Fruit Distraction Test" and "Embedded Figures Test" have shown high correlations (of .7

or more) with attention.

Denney (1974) carried out some research on the relationship of three cognitive style dimensions to elementary reading abilities.

The study used good and poor readers from grades two to five, and compared them on three cognitive style dimensions - conceptual style preferences, cognitive tempos, and attentional styles. These three dimensions were assessed with the Conceptual Styles Test, Matching Familiar Figures Test, and Fruit Distraction Test. He found that Attentional Styles measures distinguished good and poor readers better than the other cognitive style measures.

The study by Denney indicated also that poor readers' difficulties lay not in the total amount of time they attended to particular problems but in the proportion of that time spent productively examining the relevant stimuli in their visual field. Poor readers' failures to focus upon the relevant stimuli not only hinder them in the act of reading itself (by distracting them from the word or phrase to be read), but also in the process of learning how to read.

Staats, Brewer and Gross (1970) have shown that differences in the learning curves for good and poor readers being taught the letters of the alphabet through operant conditioning exist in the early trials; during such trials, the direction of attention to the learning task at hand is a most crucial factor affecting the shape of the learning curves. The Zeaman and House (1963) study mentioned earlier in this chapter would lend support to the findings of Staats, Brewer and Gross.

Attentional style refers to the child's ability to deploy his attention selectively, thereby resisting distraction from intrusive and irrelevant stimulus information. Two such styles are constriction and flexibility, children with the flexible attentional style being less distracted by irrelevant stimuli. Santostefano and Paley (1964) showed developmental advances along this dimension from constricted to flexible attentional styles. A parallel is seen in the development of selective attention through maturation and learning.

Effective reading would seem to necessitate the accurate deployment of attention and the exclusion of irrelevant and distracting information either contained within the relevant stimuli (e.g. silent letters) or in close proximity to them (e.g. pictures and other words on the page). Measures of such behaviour, and appropriate description, would seem to exist in work done by Witkin (1954) in measuring field dependent - field independent styles. French (1954) found a high correlation of his "Concealed Figures Test" (adapted from Thurstone's 1944 work) with such attentional styles as described by the terms constriction-flexibility and field dependent - field independent.

OPERATIONAL DEFINITIONS

The sample for this study consisted of twenty boys and twenty girls who fell between eleven years and eleven and a half years of age at the time of this study (November 1975). These in turn were allocated to four cells as illustrated by the following matrix:

	Good Rdrs	Poor Rdrs
Boys	10	10
Girls	10	10

Six of these children were Maori children which is consistent with the 15 per cent Maori population of the total school roll.

In this study:

(i) Good Readers are defined as those children whose raw scores on the "Progressive Achievement Test" in reading comprehension fell within the range of 20-30 raw score points. In order for these children to be categorised as "good readers" an additional precaution taken was to ensure that for each the teachers' rating on a five point scale had to be three plus or better.

(ii) Poor Readers are those children whose raw scores on the "Progressive Achievement Test" in reading comprehension fell within the range of eighteen raw score points or less. Teachers' ratings on the five point scale had to be three minus or less.

(iii) Attentional Style is defined by scores on the "Concealed Figures Test" for Grades 6-16, adapted from Thurstone (1944) by French (1954). The test measures attentional styles on a constriction flexibility continuum.

(iv) Stimulus Characteristics are defined in this study in three ways:

(a) By pictures of both "real" and "novel" animals presented in one case in appropriate settings and the other case in inappropriate settings which were atypical for such creatures.

(b) By the placing of borders around pictures, and in some cases the written text, of either black, blue, yellow, green or red.

(c) By two forms of written text: conventional orthography and "mutilated texts". The latter referring to orthography in which the initial letter of each word has been replaced by one similar in shape and size, allowing the total configuration of each word to be retained.

In addition to the "mutilated text", the fact that the context refers to a novel animal in some cases also provides a characteristic of the presented stimuli. Further to this, combinations of "mutilated" texts, coloured borders, and associated

pictures will be used to vary the stimulus characteristics.

(v) Incidental learning in this study is defined by the subject's accuracy of recall of the border colour presented with the pictures of novel and real animals in two different settings.

(vi) Intentional learning is defined for this study as the ability to respond correctly to questions about the setting in which the novel and real animals are presented.

(vii) On task time is a measure of the total time taken from the presentation of a text to the completion of the subject's reading response.

(viii) Performance in reading is judged by the number of errors recorded during the oral reading of each text.

HYPOTHESES

General:

The nature of the stimulus material will have differential effects on the reading performance, through attentional patterns, of both boys and girls classified as either good or poor readers.

General ability is controlled through the selection of good and poor readers within an intelligence test raw score range from 32 to 54, which translated to Intelligence Quotients ranges from 91 to 114. Such scores fall within one standard deviation either side of the mean for both raw scores and I.Q. scores. These scores may all be considered to fall within the average range.

The four independent variables remaining around which specific hypotheses will be based are:

(i) Previous reading performance.

(ii) Attentional style.

(iii) Stimulus characteristics.

(iv) Sex

Specific Hypotheses

(i) Poorer readers, as defined in this sample by P.A.T. scores and Teacher ratings, will score at a lower level on the "Concealed Figures Test", defined as a measure of "attentional style".

(ii) That "poor" readers as defined will make more errors on the "Concealed Figures Test" than "good" readers.

(iii) Boys, whether classified as "good" or "poor" readers will score better on the "Concealed Figures Test" than girls.

(iv) Attentional style, as defined by scores on the "Concealed Figures Test" will be related to the "on task" time of subjects when presented with certain stimulus materials.

(a) those subjects with low "Concealed Figures Test" scores will have a greater "on task" time when mutilated or traditional texts are presented with associated pictures, than will high scores;

(b) "good" readers will show a shorter "on task" time with all stimulus materials, than will "poor" readers;

(c) girls generally, regardless of the stimulus material, will show less time "on task" than boys.

(v) (a) "Poor" readers will show an increased level of reading performance on texts, whether "mutilated" or traditional orthography, presented without an illustration.

(b) "Poor" readers will show an increased level of reading performance on texts presented with borders of bright colour and no illustration.

(vi) Incidental learning scores will be higher on stimulus materials having borders with colours

high on the spectrum loci than with colours low on the spectrum loci.

(vii) In comparison with stimulus materials containing "real" animals and usual settings, scores for intentional learning will be higher for stimulus materials containing novelty (i.e. novel animals or "real" animals in novel settings).

CHAPTER III

METHODOLOGY

SAMPLE

A sample of forty children was selected from the Form One area of a city intermediate school. The particular school chosen was not different in any way from other intermediate schools in the city. No problems peculiar to this school existed, such as a large Maori population, low socio-economic status homes or the converse, school organisational patterns or staffing.

Two major categories of children were selected initially, those classified as below average readers, (defined as "poor" readers) and those classified as average to above, (defined as "good" readers). Ninety children in all were selected by a Senior Teacher responsible for the teaching of reading in the school. These children were then tested on the "Henmon-Nelson Tests of Mental Ability" Grades 6-9, Form A. From the results of this test the forty subjects were selected to fit a two by two design. For the purposes of this study it was required that general ability be controlled to negate the possibility of it being an independent variable. Therefore, twenty subjects comprising ten boys and ten girls classified as below average (or poor) readers were selected. Twenty subjects comprising ten boys and ten girls were also selected for the category of "average plus" (or good) readers. To ensure the control of general ability only those scoring on the "Henmon-Nelson" test within the boundaries of plus or minus one standard deviation of the mean were accepted.

In addition, age was also to be a controlled variable so the children selected were all between the age of eleven years and

eleven years six months at the time of the study, November 1975.

As this study was more concerned with characteristics of good and poor readers possible causes of retardation or success in reading were not taken into consideration. Socio-economic status, environment, time at school, absenteeism, changes of schools, emotional setting in the home, were not considered as independent variables for the study.

ASSESSMENT INSTRUMENTS

READING

For reading performance, "Progressive Achievement Test" (P.A.T.) in Reading Comprehension was used because it is a test standardised for New Zealand children and used predominantly in schools for assessment of reading levels. Teacher assessment of children on a five point scale was also used as it is a mandatory assessment on all school children in New Zealand twice a year. The five point scale is based on the Normal Distribution Curve and considers a hundred typical children, randomly selected, of the same age group for the allocation of these ratings. For this study the P.A.T. result and the teacher rating were required to support one another for selection as a subject.

GENERAL ABILITY

The "Henmon-Nelson Tests of Mental Ability" (H.N.) Grades 6-9, Form A, was used as a measure of general ability. The H.N. Test was selected because of its equal distribution of verbal and non-verbal items. Selection of a test of this nature was important as tests of general ability heavily weighted with verbal items give

depressed scores for poor readers. Some unpublished research McAlpine (1968) carried out in Intermediate Schools, in this city, indicated the "Hennon Nelson" test to be a more appropriate test of mental ability than the Otis tests which were at that time being used for selection into "streamed" classes at both Intermediate and Secondary Schools.

The mean raw score on Form A for Grade 6 is 37.39, and the standard deviation in raw score points is 16.63. The standard error of raw score points is 3.33.

For Form A Grade 6 the range from minus one standard deviation to plus one in raw score points would be from 20.76 to 54.02. Subjects in this study ranged from 32 to 54 raw score points.

ATTENTIONAL STYLE

The "Concealed Figures Test" from French, J.W. (1954) "Kit of Selected Tests for Reference, Aptitude and Achievement Factors" was selected as a measure of "attentional style". The test is an adaptation by Thurstone, L.L. (1944) of the "Gottscholdt Figures Test" where the subject's task is to select the one of five given simple geometrical figures that is contained in a complex geometrical figure. Seen by Thurstone as a factor in closure, the subject identifies the configuration that he has in mind in spite of the fact that the perceptual field represents a lot of material that does not belong with the configuration that the subject is trying to find, in that field.

"Concealed Figures Test" then is requiring the subject to attend to relevant cues and ignore irrelevant ones. It also requires, for success, freedom from functional fixedness, in all,

some degree of flexibility rather than constriction. Denney (1974) defines "attentional style" as the ability to deploy attention selectively, avoiding distraction from intrusive and irrelevant stimulus information. He sees the polar classifications on an "attentional style" continuum as constriction through to flexibility.

Thurstone's "Concealed Figures Test" seems to fit adequately as a measure of "attentional style" as defined by Denney. Statistical data quoted in the test manual by French (1954) gives correlations of .7 and greater with other measures such as field dependent - field independent, Witkin (1954).

STIMULUS MATERIALS

Apart from the initial screening tests for classification of subjects in reading, general ability, and "attentional style" the stimulus materials were placed on coloured slides and presented to the subject on a screen. The subject matter for slides containing pictures and/or written texts was that of animals. Animals were chosen because they have a universal appeal to people of all ages and especially children. In addition, to place the subjects in a situation which has appeal because of the subject matter, and the mode of presentation, is stress reducing. Animals too, as subject matter avoid any biassing of results through the influence of cultural sex stereotypes.

SLIDES - SET ONE

Three slides of "real" animals were deer, wolf and sheep, each of which presented the particular animal in its true setting and each was presented with a border of black,

blue, yellow, green or red.

The same three animals were presented in atypical settings but this time with coloured borders lower on the spectrum loci than in the previous presentation.

Three novel animals are presented in a similar manner, that is, in settings which seem appropriate for the type of animal portrayed and then in settings which appear inappropriate for the type of animal portrayed. Again with the animal presented in its appropriate setting, it is surrounded by a coloured border higher on the spectrum loci than those presented with the animal portrayed in an inappropriate setting. Novel animals presented were named:- dogaroo, armapine, eleshrew.

In association with each of these slides is two multiple choice questions also on slides presenting a small illustration of the animal at the top. Below this illustration the first question is presented about the setting in which the animal was seen (intentional learning). Beneath this is a question about the colour of the border around the picture (incidental learning). The order of presentation of these slides being:

Lot A 3 real and 3 novel animals in "real" settings.

Lot B Questions on setting and border.

Lot C 3 "real" and 3 novel animals presented in inappropriate settings.

Lot B Questions on setting and border.

The slides of "real" and novel animals, similar to those presented in the Paradowski (1967) study were selected as appropriate material for measuring "intentional" and "incidental"

learning.

In visual perception from the Gestalt viewpoint, there tends to be two major aspects of any visual phenomenon, that of, foreground and background (Gestalt figure-ground). The animal then, because of its size, placement in the picture, darker outlining becomes the foreground and the setting the background. Details of these two aspects are being considered as intentional learning.

The coloured border, however, as it is superfluous to the picture itself is considered as an irrelevant one to the figure ground component and, therefore, is seen as incidental learning.

SET TWO

The content of the text in each of these slides refers directly to each of the animals in turn, and their settings, of those presented in set one Lot A. However, all of these slides have a printed text which is of the "mutilated" text design.

Slides for set two were presented in three forms:

(i) A small picture of the animal with the "mutilated" text beneath it.

(ii) The "mutilated" text with a coloured border surrounding it.

(iii) The "mutilated" text on its own - no border, no picture.

The order of presentation of these slides in set two was along the pattern of (i) (ii) (iii) etc. as above.

(iii) (i) (ii)

(ii) (iii) (i)

Two recordings were made of the subject's response to these:

(i) the total time taken from the presentation of the slide to the completion of the reading of the text.

(ii) the number of word errors made by the subject in the oral reading of each text.

The assumption being made here is that the greater the "on task time" and the greater number of word errors, the subject is more likely to be distracted by irrelevant cues.

The slides in set two had the added advantage or disadvantage of the subject having seen previously an illustration of the animal in its appropriate surroundings.

SET THREE

Six animals were chosen for these slides, but not the same animals as those presented in sets one and two. Although not the same animals the same criteria was used for construction of these slides. They comprised of three "real" animals (viz. lion, mouse, elephant) along with three novel animals (viz. squirrabat, elefish, mousaroo). In each the text referring to the animal and its setting was presented in "mutilated" text. These in turn were presented as in set one, that is, in three different ways of:

(i) "mutilated" text without border or picture.

(ii) "mutilated" text with a coloured border surrounding it.

(iii) "mutilated" text presented with a small illustration of the animal above, but no border.

Set three slides, however, were presented in the reverse order to those in set two to negate the effects of practise and familiarity.

As for set two "on task" time was recorded and number of word errors in reading orally the text. Set three slides in comparison with set two was introduced to give a measure of the influence of the familiarity with the animals as presented in set one and the recall demanded by the questions presented in that section.

SET FOUR

The final set of slides was introduced as a control measure of the effects of "mutilated" texts on attention and reading performance. For the measurement of effect, if any, of the "mutilated" text, these slides contained descriptions of animals, not presented in other slides, but written in traditional orthography.

The slides were presented in the following order and form:

(i) orthodox script about a real animal (a cat) without picture or border.

(ii) orthodox script about a "real" animal (a pig) with an illustration of the animal above the text.

(iii) orthodox script about a novel animal (a rabrat) with an illustration of the animal above the text.

(iv) orthodox script about a "real" animal (a cow) with a brightly coloured border around it.

(v) orthodox script about a "real" animal (a dog) with a small illustration above the text and a coloured border surrounding the text and picture.

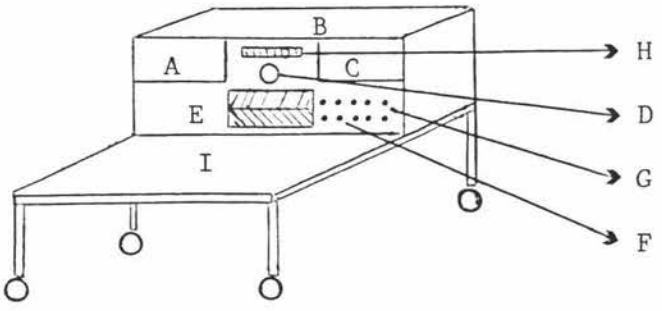
Similar measures as those made for sets two and three, of "on task" time and word errors in oral reading were made.

METHOD OF PRESENTATION

The "Progressive Achievement Test" in reading comprehension was administered, according to the instructions in the Teachers' Manual by the reading resource teacher in the school. All subjects were tested in their familiar classroom setting along with all other members of the class at the beginning of March 1975, as the test manual suggests.

The "Concealed Figures Test" and the "Henmon-Nelson Test of Mental Abilities" were administered by the researcher, as set down by their manuals of instruction. The administration and sitting of these tests was carried out with potential subjects in the school hall. The "Henmon-Nelson Test" was administered firstly, and the forty subjects chosen, who were tested on the "Concealed Figures Test" one week later in a classroom in the school concerned.

The presentation of the slides on the other hand was presented through a screen by way of a back mounted projector - all of which were mounted on a bench equipped with trolley wheels. Other features of this equipment are best illustrated by the following diagram:



KEY

A. Screen for back mounted and remotely controlled slide projector.

B. Area where back mounted slide projector is located.

C. Video-tape screen.

D. Microphone connected to tape recorder to record responses.

E. Two-way speaker and microphone for communications between subject and researcher.

F. Response buttons for subject to operate.

G. Lights indicating which response button subject has pushed.

H. Digital timer graduated in tenths of a second.

I. Bench at which subject sits.

PROCEDURE

The "Simulation" apparatus, as illustrated, was transported to the particular school and the subjects involved taken through the equipment, viewing and responding to the slides over a period of one week. Each subject was involved for a period of approximately one hour. During this time the researcher recorded time "on task",

word errors, number of questions answered correctly, and comments to an open ended question.

Each subject was presented firstly with a novel animal in an appropriate setting as a trial slide. Presentation of this slide was preceded by a short period of time during which they were made familiar with the functioning of the machine and rapport re-established so as minimal stress existed.

Following this period of rapport and trial slide, set one slides (Lot A first) were presented. For these the instructions given were: "I am going to show you some slides of animals which I want you to look at carefully - note as much as you can but let me know immediately you have finished looking." Set one Lot A were presented in the order of one "real" animal, one novel animal. At the conclusion of these six slides the following instructions were given for the questions, Lot B; "I will now show you slides, each of which has a picture of the animals you have just seen, but beneath each picture there are two questions for you to answer. If you think "A" is the correct answer push the button marked "A". Answer question one first before doing question two. Remember in either question whichever letter you think is the correct answer push the button labelled with that letter - A, B, C, D or E. At the conclusion of each set of questions an open ended question was posed and the subject's answer recorded. The question was as follows: "Was there anything else you noticed?" Answers to this question were to be analysed in terms of the constriction-flexibility continuum measured by the "Concealed Figures Test".

Identical instructions were given for set one. Lot C and the following questions Lot B. Slides from Lot B were only exposed for a maximum of thirty seconds.

During this presentation time of viewing each slide was recorded as was the response to the questions.

Following a one minute break the subject was then instructed for set two of the slides. The instructions differed this time as it was predominantly a reading situation. The instructions were as follows: "This time I am going to present to you a number of slides which have on them a paragraph written about each of the animals you have just seen. When you are ready I want you to read aloud the paragraph about each animal."

Recordings were made of:

(i) time before starting (i.e. from time of presentation to first attempt at a response)

(ii) total time "on task"

(iii) number of words wrong in oral reading.

The procedure outlined was carried out with three sets of slides depending on whether they had a picture, a border, or just the printed text. Following each set of six slides a pause of one minute was given.

Sets three and four were presented with almost the same instructions, the same pause between lots and an interval of fifteen seconds in between each slide as was standard for the previous slides. The alteration to the instructions was: "This time I am going to present to you a number of slides with para-

graphs written about some new animals. When you are ready ...."

Recordings were also made of the same responses and response conditions as in set two above.

For the presentation of all slides the researcher stood behind the subject and gave the instructions through the two way speaker and operated the remote control of the slide projector.

RESULTS

The four cell division of subjects by sex and reading achievement which was based on "Progressive Achievement Tests" (P.A.T.) in reading comprehension and Teacher assessment on a five point scale are shown in tables 1-4. Included in these tables are the results on the "Henmon-Nelson Tests of Mental Ability" Grades 6-9, Form A (H.N.) and the measure of "attentional style" from the "Concealed Figures Test" (C.F.T.). The raw scores of these tests were used as age was held constant by selecting subjects between the ages of 11 years and 11½ years of age on the 1st November, 1975. Such a half year restriction in age enabled raw scores to be used rather than a converted score.

With the "Concealed Figures Test" scores for the number correct, the number of errors and the difference between the number correct and the number of errors were all recorded.

Table I Raw scores and Teacher Assessment for boys on P.A.T., H.N., and C.F.T. classified as good readers.

Subjects	Teacher Assess-ment	P.A.T. Compreh.	H.N.	H.N. I.Q. Equiv.	C.F.T. Correct	C.F.T. Errors	C.F.T. Differ.
*G.R.B. 1	3+	21	38	92	35	19	16
" 2	3+	21	43	99	40	34	6
" 3	2	22	50	110	37	28	9
" 4	3+	23	51	111	48	18	30
" 5	3+	25	54	111	41	21	20
" 6	3+	25	54	112	41	35	6
" 7	3+	25	42	98	42	3	39
" 8	3+	25	44	102	51	16	35
" 9	3+	25	36	97	42	44	-2
" 10	3+	19	53	114	42	14	28

*G.R.B. - Good reader boy.

The mean and range for each set of raw scores in Table I is as follows:-

	$\bar{x}$	RANGE
P.A.T.	23.1	19 - 25
H.N.	46.5	36 - 54
C.F.T. (Correct)	41.9	35 - 51
C.F.T. (Errors)	23.2	3 - 44
C.F.T. (Diff.)	18.7	-(2)- 39

Table II Raw scores and Teacher Assessment for girls on P.A.T., H.N., and C.F.T. classified as "good" readers.

Subjects	Teacher Assess-ment	P.A.T.	H.N.	H.N. I.Q. Equiv.	C.F.T. Correct	C.F.T. Errors	C.F.T. Differ.
*G.R.G. 1	3+	20	39	99	34	44	-10
" 2	3+	20	38	96	34	36	- 2
" 3	3+	20	46	104	55	11	44
" 4	3+	22	33	93	44	22	22
" 5	2	23	49	109	43	33	10
" 6	3+	23	46	104	38	37	1
" 7	2	24	52	108	33	31	2
" 8	3+	24	47	106	35	37	- 2
" 9	3+	28	43	91	28	34	- 6
" 10	3+	25	40	98	55	11	44

*G.R.G. - Good Reader Girl.

The mean and range for each set of raw scores in Table II is as follows:

	$\bar{X}$	RANGE
P.A.T.	22.9	20 - 28
H.N.	43.3	33 - 52
C.F.T. (Correct)	39.9	28 - 55
C.F.T. (Errors)	29.6	11 - 44
C.F.T. (Difference)	10.3	-(10) - 44

Table III Raw scores and Teacher Assessment for boys on P.A.T., H.N., and C.F.T. classified as "poor" readers.

Subjects	Teacher Assessment	P.A.T.	H.N.	H.N. I.Q. Equiv.	C.F.T. Correct	C.F.T. Errors	C.F.T. Differ.
*P.R.B. 1	4	11	42	98	50	17	33
" 2	4	11	36	95	39	18	21
" 3	3-	13	36	95	34	30	4
" 4	3-	14	34	91	40	16	24
" 5	3-	14	38	96	38	20	18
" 6	3-	15	38	96	49	19	30
" 7	3-	17	32	92	37	19	18
" 8	3-	17	51	109	36	29	7
" 9	3-	18	43	101	31	10	21
" 10	4	9	40	97	42	26	16

*P.R.B. - Poor Reader Boy.

The mean and range for each set of raw scores in Table III is as follows:

	$\bar{X}$	RANGE
P.A.T.	13.9	9 - 18
H.N.	39.0	32 - 51
C.F.T. (Correct)	39.6	31 - 50
C.F.T. (Errors)	20.4	10 - 30
C.F.T. (Difference)	19.2	4 - 33

Table IV Raw scores and Teacher Assessment for girls on P.A.T., H.N., and C.F.T. classified as "poor" readers.

Subjects	Teacher Assessment	P.A.T.	H.N.	H.N. I.Q. Equiv.	C.F.T. Correct	C.F.T. Errors	C.F.T. Differ.
*P.R.G. 1	3-	11	40	97	42	34	8
" 2	4	12	39	96	32	17	15
" 3	3-	14	43	101	40	31	9
" 4	3-	15	40	98	35	32	3
" 5	3-	15	34	94	39	34	5
" 6	3-	13	38	96	46	21	25
" 7	3-	15	44	104	42	31	11
" 8	3-	16	45	104	45	31	14
" 9	3-	16	35	94	38	45	-7
" 10	3-	17	38	98	20	55	-35

*P.R.G. - Poor Reader Girl.

The mean and range for each set of raw scores in Table IV is as follows:

	$\bar{X}$	RANGE
P.A.T.	14.4	11 - 17
H.N.	39.7	34 - 46
C.F.T. (Correct)	37.9	20 - 46
C.F.T. (Errors)	33.1	17 - 55
C.F.T. (Difference)	4.8	-(35) - 25

Table V Summary of the means of raw scores on P.A.T., H.N., and C.F.T. for the four groups of subjects used.

Group	P.A.T.	H.N.	C.F.T. Correct	C.F.T. Errors	C.F.T. Differ.
G.R.B.	23.1	46.5	41.9	23.2	18.7
G.R.G.	22.9	43.3	39.9	29.6	10.3
P.R.B.	13.9	39.0	39.6	20.4	19.2
P.R.G.	14.4	39.7	37.9	33.1	4.8

In comparing boys with girls on the error score of the C.F.T. using a one tailed t-test, boys had significantly less errors than girls ($p < .005$). However, comparing boys and girls on correct scores the t-test failed to show a significant difference. No significant difference was shown also between the correct scores of "good" and "poor" readers.

For all subjects the mean and standard deviation was computed on difference scores on C.F.T. giving results of $\overline{X} = 13.25$ and $Sd = 15.84$ illustrating that all groups fell well within the range of ± 1 standard deviation. The C.F.T. difference scores though are of little use to this study because of their large standard deviation. However, on correct scores C.F.T. the $\overline{X} = 39.83$ and $Sd = 6.97$ four subjects fell below -1 standard deviation and six beyond +1 standard deviation. These subjects were classified accordingly as those scoring low on C.F.T. and those scoring high on C.F.T. Their results were then compared in all three conditions (i.e. text, text and picture, text and border) for "on task" time. Although the high scores showed a shorter on task time in all three conditions a one failed t-test failed to show any significance in this difference.

Table VI Means and standard deviations of "on task" time for all subjects' reading passages with text and picture, text only, text and border. (Mutilated texts.)

*Condition	$\bar{x}$	Sd
T + P	41.52	12.71
T	34.97	9.17
T + B	31.77	9.22

*T + P - Text plus picture.

T - Text only.

T + B - Text plus a coloured border.

A one tailed t-test was carried out comparing the mean "on task" time of "good" readers with "poor" readers when required to read a text with an accompanying picture. Similar tests were carried out comparing "good" with "poor" readers on the other two conditions of text only and text with a coloured border.

In the first case "good" readers spent significantly less time "on task" than "poor" readers when presented with a text and an accompanying picture ($p < .05$).

The difference was also significant ($p < .05$) when presented with a text only, that is, "poor" readers spent more time "on task" than good readers. However, there was found to be no significant difference between the two groups of "good" and "poor" readers in "on task" time when presented with a text surrounded by a coloured border.

Boys and girls were also compared in "on task" time in the

same three conditions but in none of the three conditions was there found to be any significant difference.

One tailed t-tests were also carried out on the differences between mean "on task" timefor texts presented in traditional orthography. In comparing "good" readers with "poor" readers the former showed a shorter "on task" time ($p < .10$). The same significant difference was found to exist between "good" girl readers and "poor" girl readers ($p < .10$). The difference, however, between "good" boy readers and "poor" boy readers was not shown to be significant. As may have been predicted from the above two results girls' "on task" time showed to be significantly shorter than boys' "on task" time ($p < .10$).

"Reading performance" of "poor" readers on a text and associated picture was compared with performance on a text only. The predicted difference of less errors on the text condition appeared to exist and from the mean scores a one tailed t-test showed the difference to be significant at the .10 level ($p<.10$).

"Poor" readers "performance" on a text as compared with a text and coloured border was also calculated by the use of a one tailed t-test. The improved performance on the text plus border condition proved to be significant ($p<.05$).

Although overall poor readers showed improved "reading performance" when a text was presented with a border, there appeared to be a greater "performance" when the border was of a bright colour (i.e. yellow and red). A one tailed t-test showed the improved reading performance with a bright coloured border to be significant ($p<.005$).

Differences also appeared to exist between mean on "task time" of texts or pictures containing "novelty" than those presented about real animals and typical settings. One tailed t-tests comparing "novelty" and "reality" were carried out between all presentation conditions and also between those scoring high on C.F.T. and those scoring low on C.F.T. The subjects selected for this latter condition were those whose scores (correct) on C.F.T. were outside of ± 1 standard deviation. None of these differences showed to be significant.

Measures of "intentional" and "incidental" learning were also calculated from the results of set one slides. The means for intentional learning in the two conditions were as follows:-

Novelty 1.5

Reality 1.3

A one tailed t-test showed the difference in favour of the novel condition not to be significant.

"Incidental" learning measured by the subject remembering the colour of the border around set one slides showed no difference between bright or dull border conditions as both had a mean of 2.

In addition to this it was found that "good" readers spent less time viewing slides of animals in set one ($p < .10$). Girls were also found to spend more time on the average viewing these slides ($p < .10$).

DISCUSSION

During the individual testing situation, all forty subjects were given the opportunity to make any additional observations they

wished about set one slides in response to the "open" question asked during the answering of the questions in set one lot B slides. One boy only offered a response, "I'm only interested in prehistoric animals" and his viewing time of the "armapine" was three times that spent viewing the other animals. The other thirty-nine subjects simply answered "No". An explanation to this could be given by the reasonably high level of anxiety noted by the tester of all subjects in the testing situation. Further, analysis of the slides indicate little additional information to be noted other than the animal, the setting and the coloured border. However, it was anticipated that comments about the "novel" animals or the atypical settings may have been made. There is an assumption of course being made here which may well be erroneous; that the subjects found the animals novel and found the settings atypical.

Data collected to test hypothesis one that "'Poorer' readers as defined in this sample by P.A.T. scores and teacher ratings, will score at a lower level on the C.F.T., defined as a measure of 'attentional style'" failed to show any significance. The hypothesis, therefore, was not supported. An explanation for this lack of significance may be found in the instrument used. The C.F.T. has forty-nine examples in it but a shortened version containing only twenty-eight examples was used for this study. A number of subjects were observed to finish the test inside the time limit of ten minutes, whereas had the full length test been used few if any may have finished within the time. Higher scores would also have occurred creating a greater difference between the "good" and "poor" readers.

The same explanation may also be used in discussing the lack of any significant difference between "good" and "poor" readers on the C.F.T. error score. The Revised (1962) "French Kit" contains a much more difficult test than the "Hidden Figures Test" which during the initial selection of instruments was considered by the researcher to be too difficult for the age group of the subjects being used. Such a test may have proved to be more useful in showing significant differences between the two groups of "good" and "poor" readers. Hypothesis two then, is not supported by any statistical data -

"That 'poor' readers as defined, will make more errors on the C.F.T. than 'good' readers."

C.F.T. error scores, however, when boys were compared with girls showed significantly that boys made less errors than girls ($p < .005$). Although on C.F.T. correct scores no significant difference was shown between boys and girls some support from the error score may be seen for the third hypothesis that -

"Boys, whether classified as 'good' or 'poor' readers will score better on the C.F.T. than girls."

Certainly boys show a greater degree of accuracy in identifying concealed figures. Again, more support may have been available if the longer form of the test had been used or the Revised (1962) "Embedded Figures Test". Further a more sensitive statistical test to differences such as the "Man Whitney U" may have demonstrated the predicted difference.

To decide which subjects could be classified as high and which as low scores on the C.F.T. the cut off points of ± 1 standard deviation were used. As it is predicted that at least two-thirds

will fall within these boundaries it was felt that those outside of them could rightfully be termed high or low scorers. In this study, however, eighty per cent fell within the ± 1 standard deviation leaving only twenty per cent, that is, eight subjects to be considered as high or low scorers. Within the small number of eight, six were classified as high scorers and only two as low scorers on the C.F.T. Although the raw data showed a greater "on task" time for the low scorers than the high scorers on all stimuli presented it failed to be significant. However, the predicted direction existed and with a larger sample support may well have existed for hypothesis four (i) that

> "Those subjects with low C.F.T. scores will have a greater 'on task' time when mutilated or traditional texts are presented with associated pictures, than will high scorers."

Hypothesis four (ii) that

> "'Good' readers will show a shorter 'on task' time with all stimulus materials, than will 'poor' readers"

was supported in most instances. "Good" readers showed significantly less time than "poor" readers in "on task" time with

(i) Mutilated text and picture ($p < .05$)

(ii) Mutilated text only ($p < .05$)

(iii) Traditional orthography (all conditions) ($p < .10$).

Readability level of all texts was not taken into consideration and could well have been a factor influencing these

results. "Poor" readers too seem to be distracted from the printed text by the presence of a picture increasing their "on task" time.

Girls generally showed a shorter "on task" time than boys with traditional orthography ($p < .10$). It was surprising that this condition did not hold with the "mutilated" texts too. Only partial support then is given to hypothesis four (iii) that

> "Girls generally, regardless of the stimulus material, will show less time 'on task' than boys."

It was noted in the testing situation that the subjects all had a strong desire to be correct with their identification of each word in the "mutilated" texts. While some would concentrate on a word trying to identify it others would read on and come back to a word to try and identify it correctly. Observations indicated that boys generally adopted the former strategy while girls adopted the latter. A similar attitude is supported by the results on the C.F.T. - boys being inclined to an analytical strategy while girls adopt a more global one. For both boys and girls unusual phrases proved time consuming - e.g.

> "this cheeky little fellow"
> "pushing his nose in where its not wanted"
> "a friendly but timid animal".

The subjects involved were also told by the school that each would go through approximately a forty minute to one hour testing session which may have been the cause of a great deal of the noted anxiety.

In "reading performance" as defined by this study "poor" readers were found to be more successful on a text only, than a

text with an accompanying picture ($p < .10$). Their "reading performance" on a text with a border around it was significantly better than their performance on a text only ($p < .05$). In all hypothesis five (i) was given quite strong support. It states that

> "Poor readers will show an increased level of reading performance on texts, whether 'mutilated' or traditional orthography, presented without an illustration."

In association also with the previous results, hypothesis five (ii) which states that

> "'Poor' readers will show an increased level of 'reading performance' on texts presented with borders of bright colours and no illustrations."

"Mutilated" and traditional texts with bright coloured borders (red or yellow) showed "poor" readers to have a significantly greater "reading performance" ($p < .005$). Borders whether bright or dull colours showed all readers, whether "good" or "poor" to have a shorter "on task" time and "poor" readers certainly to have an increased "reading performance" (i.e. less errors). Such a phenomenon needs some explanation. The distraction of a picture from the text seems to be quite marked. While observing the subjects reading a text with a picture their eyes continually flicked from text to picture. Whereas when first exposed to a slide with picture and text the initial focus seemed to be on the picture and not the text. It was also noted that errors made on texts without

a picture were seldom corrected when the same text was presented with a picture. The only time the picture assisted was in phrases like "a long thin nose" (elefish) or "by the use of a type of radar" (squirrabat) where these appendages could actually be seen in the illustration. Some of the good readers, however, seemed to take no notice of the picture at all. The borders around the text seemed to provide a focal point for the readers, namely, the printed text and for "poor" readers no distractions.

From the point of view of the Gestalt "Figure-Ground" phenomenon the border assists in defining the figure (printed text) as distinct from the ground (white background). As Bryant (1974) pointed out "in children's perception they seem to attend to the background as much as the foreground" but the coloured border delineates and reduces the background thus producing less interference for the reading act.

Although Paradowski (1967) found that curiosity or aroused drive states increased incidental learning this finding was at sharp variance with other studies which found "that drive arousal leads to reduced incidental learning" (Paradowski, 1967, pp. 50). In this study with set one lot A slides the mean score for "incidental" learning was .9 and this score includes recall of dull colours as well as bright colours. Support is not given to Paradowski's finding from these results. But it may well be a false assumption that the subjects in this study had aroused curiosity with the animals and settings presented in the slides. Set one lot C slides were also to be used in the assessment of incidental learning. The results from this viewing were not considered as valid because it was considered that the "incidental"

learning at this stage was in fact to the subjects "intentional" learning and this is illustrated by the increase to a mean of 2 quoted in the results. It is considered after analysis of the data collected that a more accurate assessment of "incidental" learning would have been provided by asking the subjects what colour border appeared around the "mutilated" texts.

Hypothesis six then was not supported in this study:

> "'Incidental' learning scores will be higher on stimulus materials having borders with colours high on the spectrum loci than with colours low on the spectrum loci."

The final hypothesis (seven) which stated that

> "In comparison with stimulus materials containing 'real' animals and usual settings scores for 'intentional' learning will be higher for stimulus materials containing novelty,"

received no support from the results gathered in this study from subjects viewing of set one lot A and C slides. A comparison of the two means on a one tailed t-test failed to show any significant difference. Unfortunately no data was gathered from the subjects as to whether or not they did find some of the animals or settings interesting or novel. Failure to support the hypothesis could well be explained by the subjects attention being concentrated on the animal rather than the setting, if in fact they did find the animals novel. A further explanation could be provided by the Primacy/Recency Effect. It seems also that in each slide the animal was presented in the centre foreground as the focal point

yet the questions asked to test "intentional" learning were on the setting only. A more appropriate test may have been carried out through a description of the animal although this would have taken more time and recording and possibly created problems for analysis.

CONCLUSION

The interesting feature of the results of this study is the effect a brightly coloured border seems to have on the reading performance of "good" but in particular "poor" readers. In addition, support is given to research findings about the distracting nature of pictures, especially to "poor" readers (Samuels, 1967). There is of course a great deal more research which needs to be done with these two findings and the many and varied combinations, such as picture, with text and border on adjacent page, or text with border over the page .... More careful measures also need to be made of the age groups with which the picture is distracting and the border around the text helps direct attention to the relevant cues. More information is needed too, on the achievement levels in reading with which these two factors have any marked effect. The indication provided here that a border around a text seems to increase "reading performance" with poor readers may well indicate some value for younger children in the early learning to read stages.

The several hours spent observing and recording the responses of subjects in this study raised many additional questions

about the nature of the reading process and the concept of attention, all of which require further investigation.

Attention, for example, needed much more precise and objective measures such as pupil dilation, body position and altered states of respiration to mention but a few. Some of these states which indicate increased attention were observed in the testing situation.

Reading of the "mutilated" texts gave an insight into strategies used by children in the decoding process of the printed symbol from word recognition skills through to context. Although no analysis was made of the subjects' errors it was noted that initial consonant, outline shape of the word and distinctive letters or letter combinations (such as "ee", "th", "tt") in the middle of words were the most common strategies used for breaking the code. Although no statistical data is available to support these observations they are much in line with what Rayner and Kaiser (1975) found. Words with the highest frequency of errors were the small words which act as connecting links but have little definable meaning (e.g. as, is, so, to, too, the, its, on, an).

"Mutilated" texts were effective in one way, in that they made it necessary for the reader to use context and from this predict further the context of the passage. Incorrect predictions because of differential language patterns of reader or text made remaining sections of the text in some cases unreadable although it may have been read correctly in one of the previous readings.

All the points mentioned in this section provide important areas for study and future research. Any subsequent

research in a similar area to this study would need to look carefully into the selection of more exacting measures of "attentional style", levels of attention while on task and reading performance. The design of the study would also need alteration, some of the points for consideration have already been mentioned in the discussion section. One point not mentioned is the time subjects spent in the testing situation (from forty-five minutes to one and a quarter hours) which produced signs of fatigue and in some cases boredom. What influence these had on the results is difficult to say.

Although some of the results did not prove to be statistically significant the predicted direction was indicated in all cases. Similar studies in the future would be well advised to use a larger sample selected from a broader cross section than that provided by one school and to try out a greater range of stimulus materials.

Nevertheless, indications from the data and informal observations seem to support that the nature of the stimulus material does effect attention and subsequent reading performance.

APPENDIX I

Stimulus material used in the study. Those presented in this appendix are Xerox copies of the originals which were photographed and presented to the subjects as coloured slides projected on to a screen.

Set One Lot A

3 real animals)
) in typical settings
3 novel animals)

Lot B

Questions

Lot C

3 real animals)
) in atypical settings
3 novel animals)

Set Two

Six animals presented in set one were used as the subjects for "mutilated" texts and were presented in three forms:

(i) picture plus text

(ii) text only

(iii) text plus coloured border

Set Three

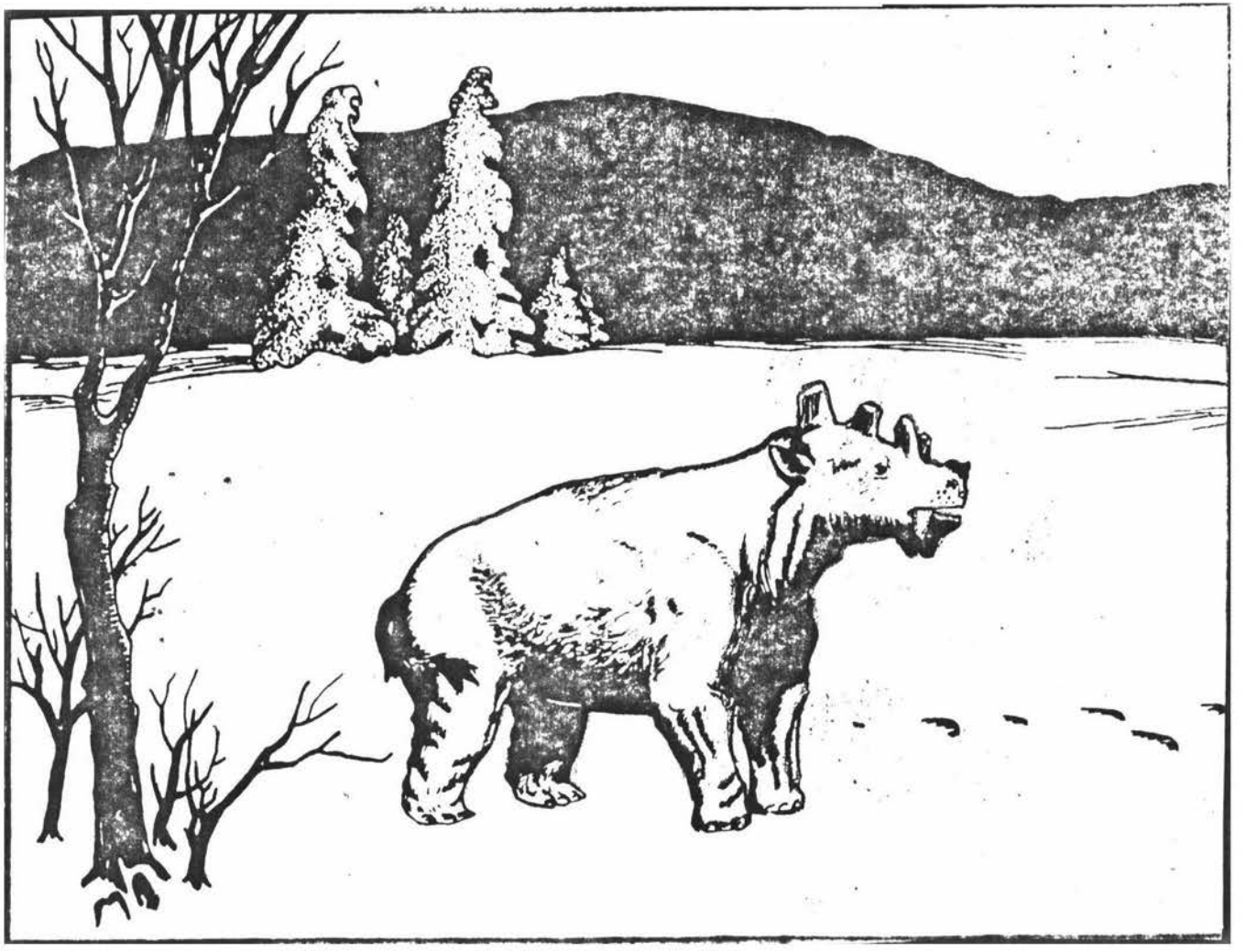
Six animals used as the subjects for "mutilated" texts but not those of sets one or two. These were presented in the same three ways as set two slides.

Set Four

Five slides, the subject animals not presented in previous sets, the text being in traditional orthography.

TRIAL SLIDE

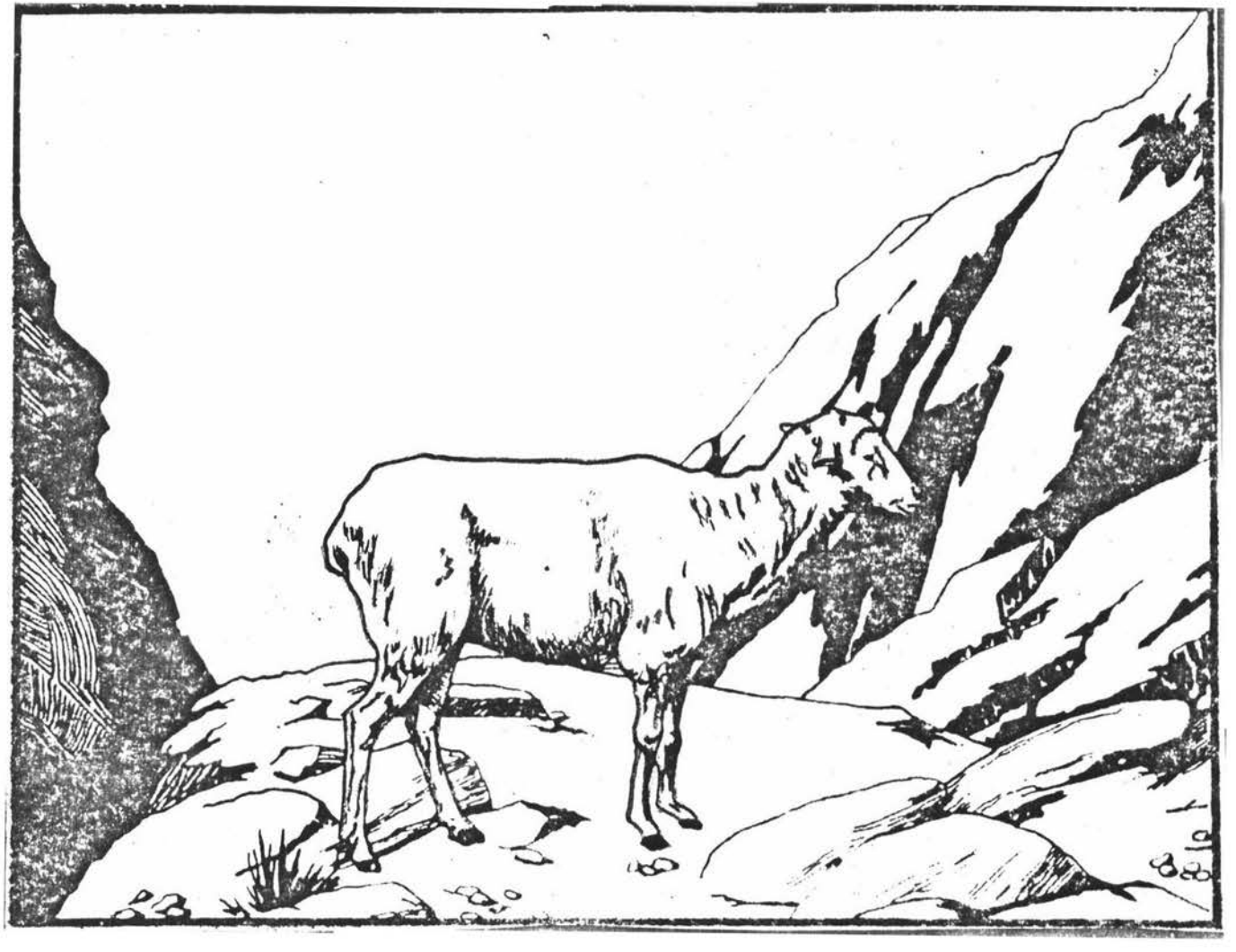
RED

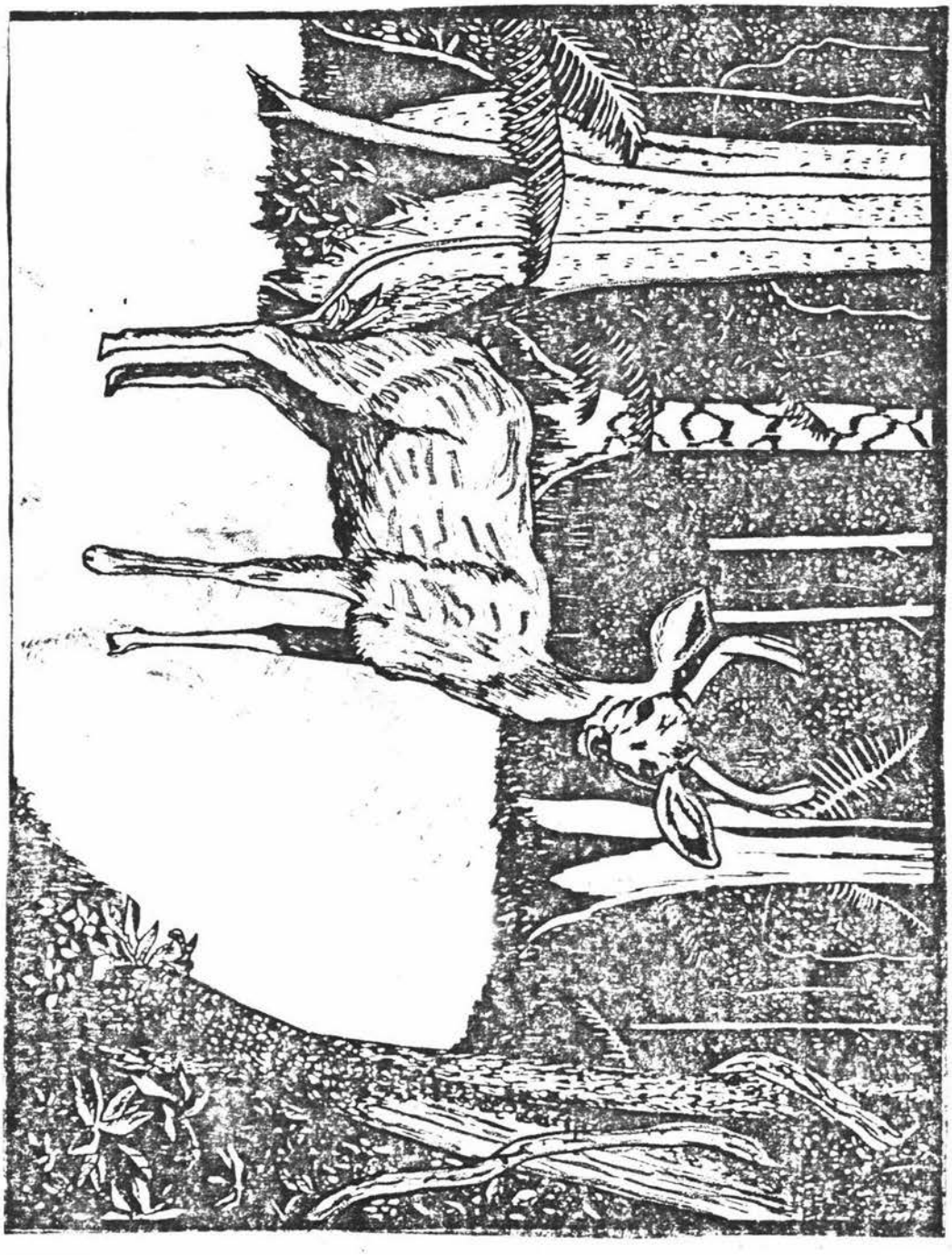


SET ONE

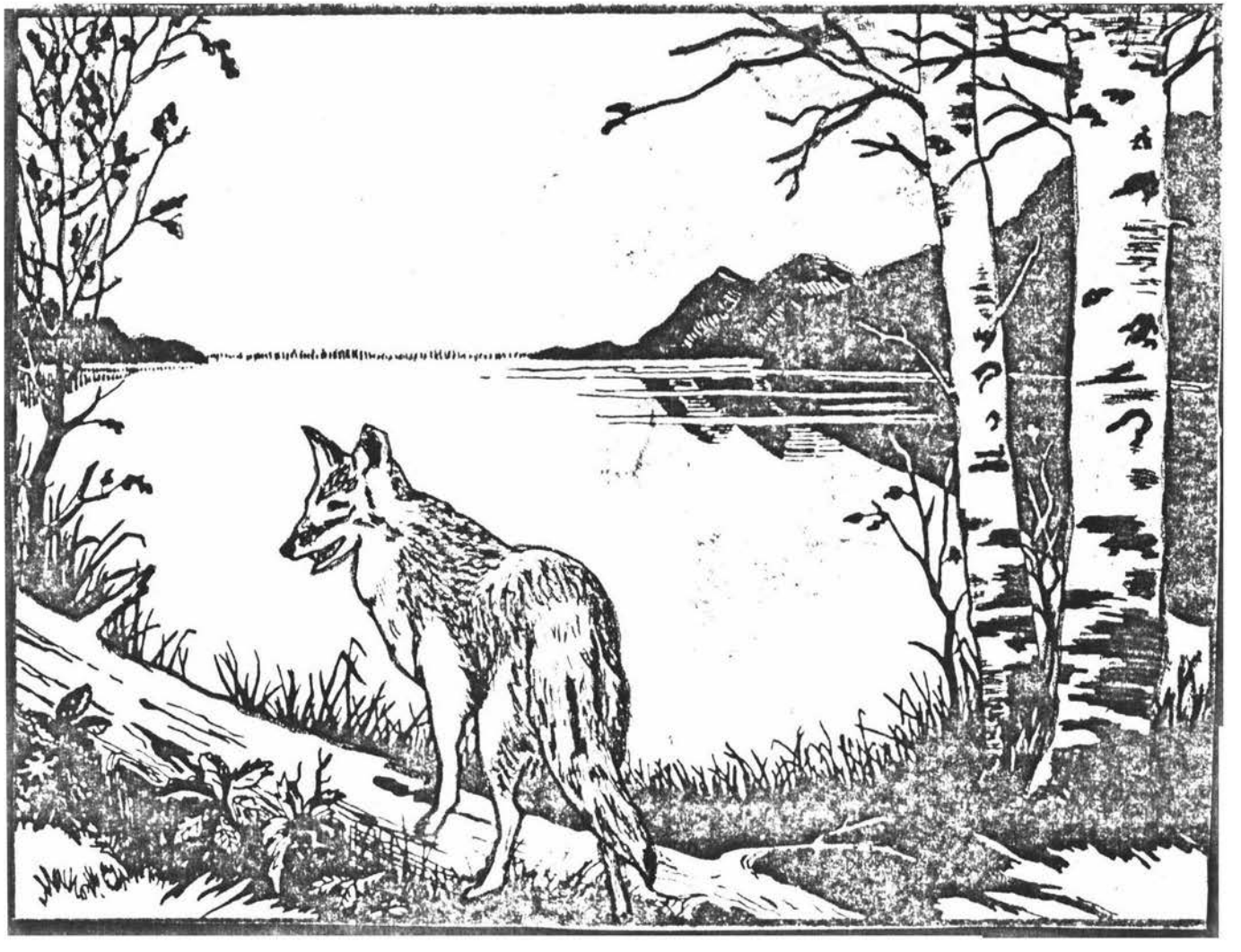
LOT A

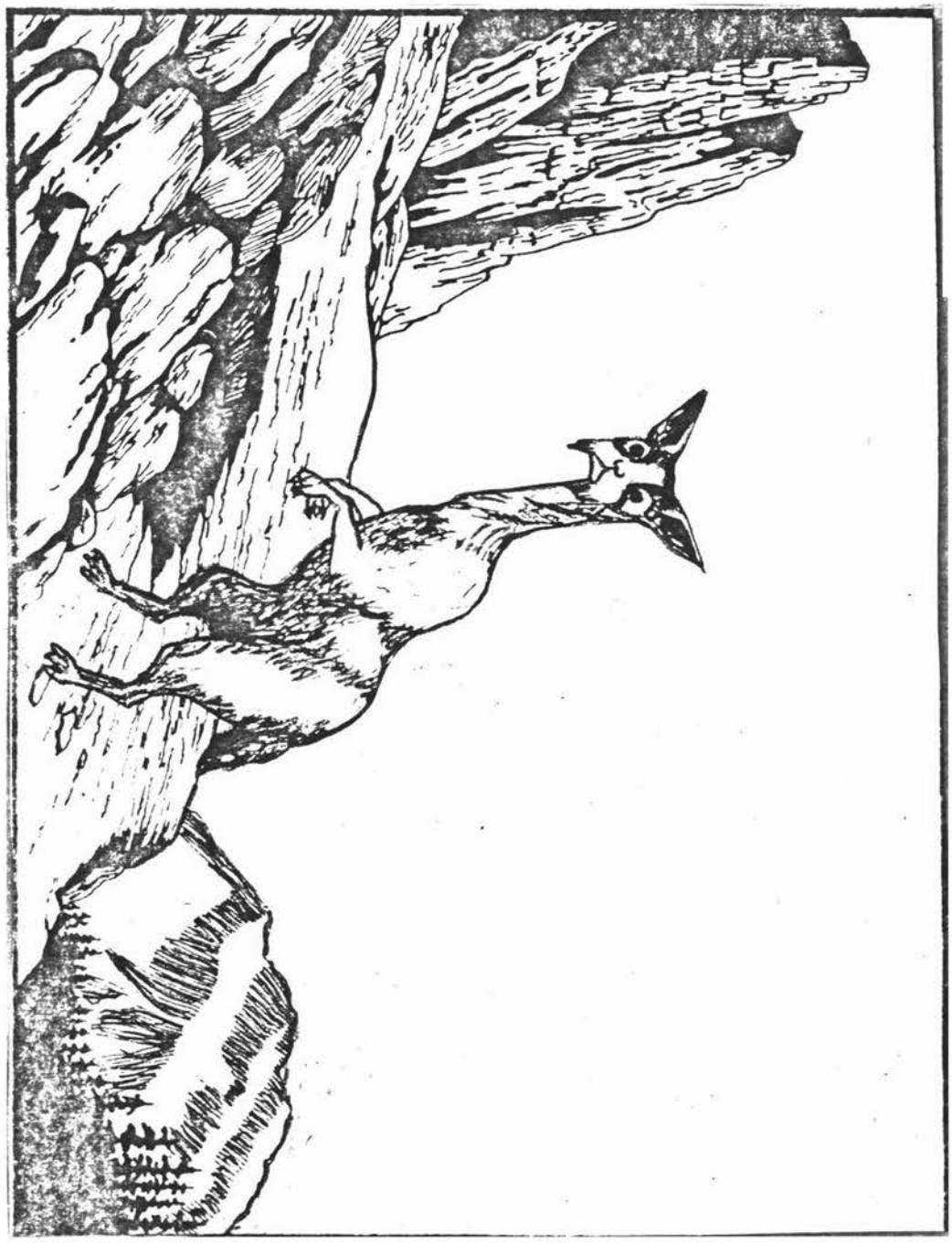
GREEN





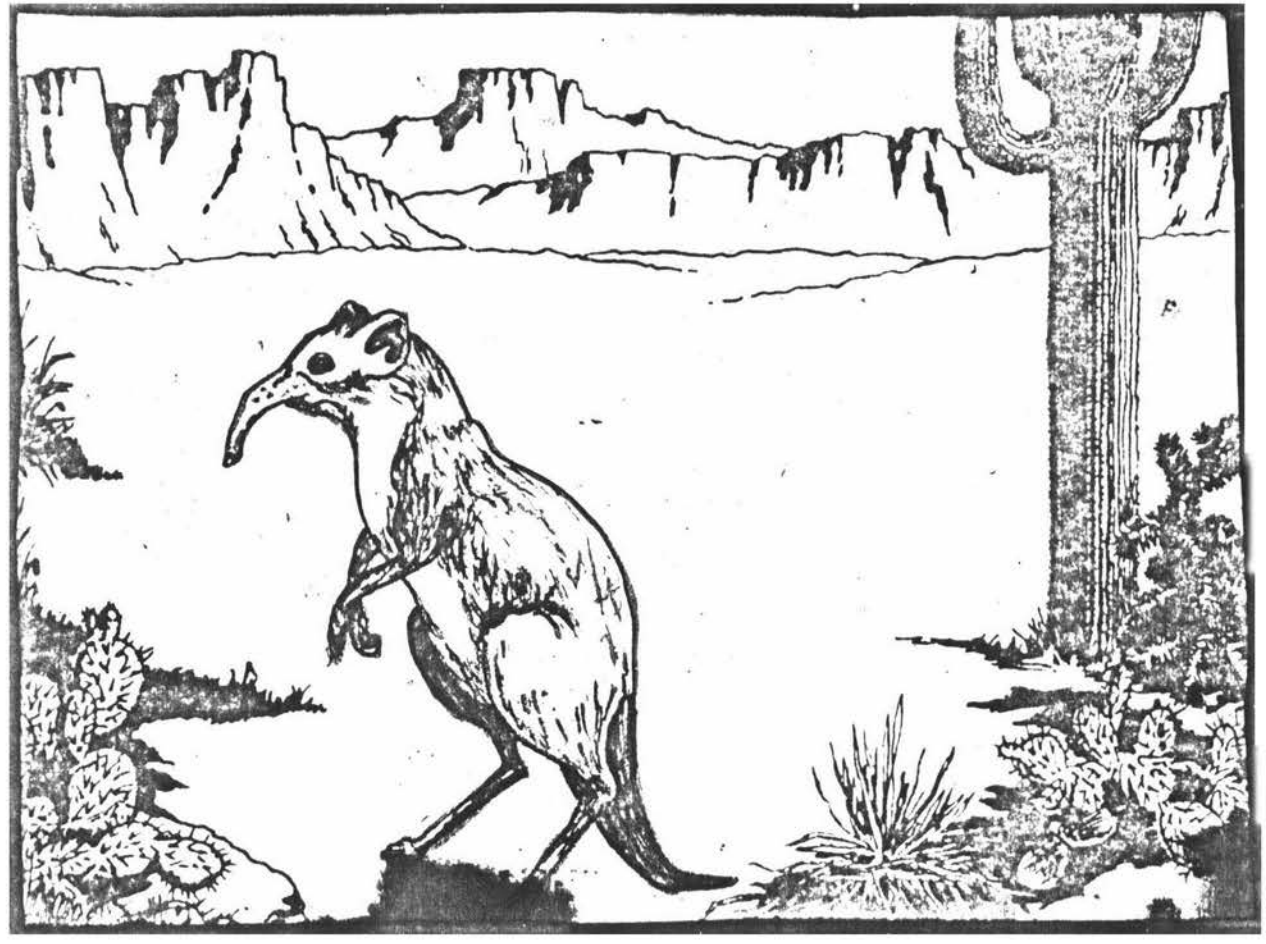
BLUE



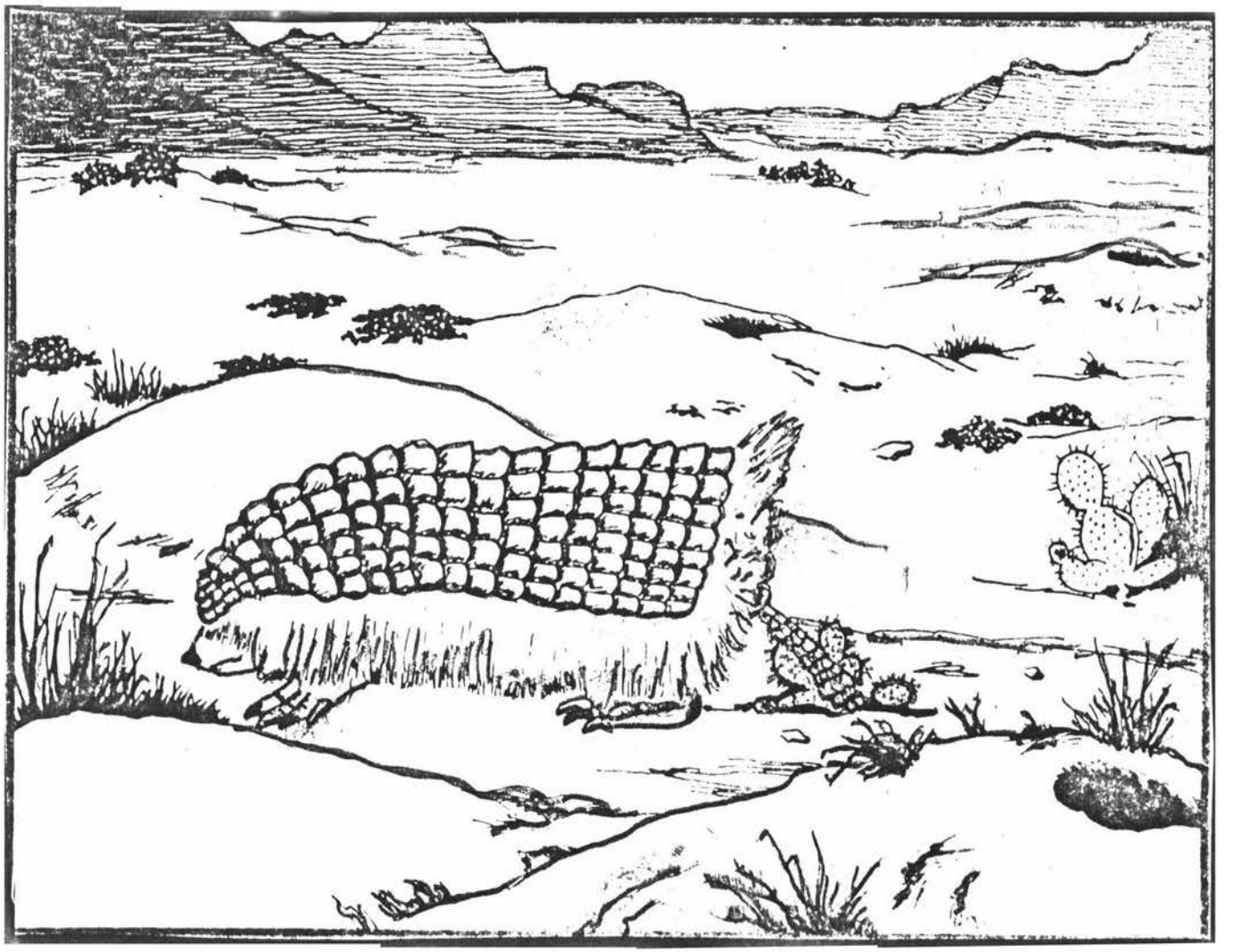


YELLOW

BLACK

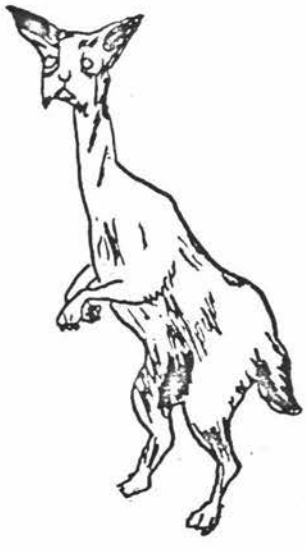


RED



SET ONE

LOT B



In which one of the five following types of settings did the above animal appear?

1. forest or woodland;
2. prairie or desert;
3. jungle or dense underbrush;
4. mountainous or rocky;
5. swamp or marsh;

What was the color of the border around this animal's picture?

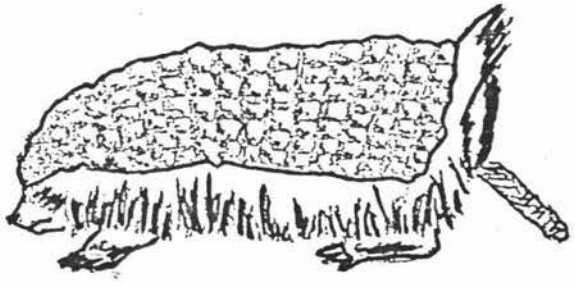
1. blue;
2. green;
3. black;
4. red;
5. yellow;

In which one of the five following types of settings did the above animal appear?

1. forest or woodland;
2. prairie or desert;
3. jungle or dense underbrush;
4. mountainous or rocky;
5. swamp or marsh;

What was the color of the border around this animal's picture?

1. blue;
2. green;
3. black;
4. red;
5. yellow;



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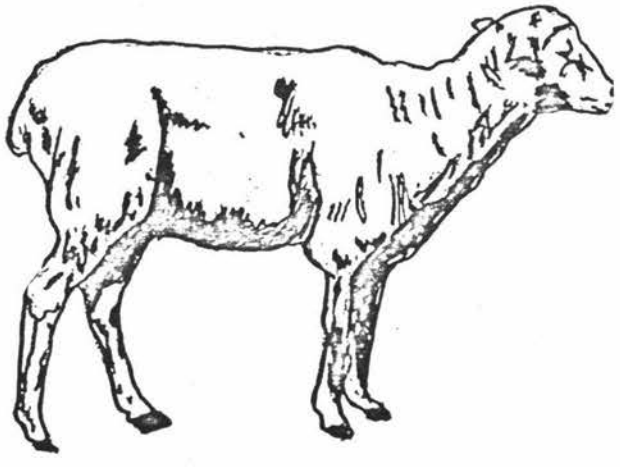
1. blue;
2. green;
3. black;
4. red;
5. yellow;



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2. prairie or desert;
3. jungle or dense underbrush;
4. mountainous or rocky;
5. swamp or marsh;

What was the color of the border around this animal's picture?

1. blue;
2. green;
3. black;
4. red;
5. yellow;

In which one of the five following types of settings did the above animal appear?

1. forest or woodland;
2. prairie or desert;
3. jungle or dense underbrush;
4. mountainous or rocky;
5. swamp or marsh;

What was the color of the border around this animal's picture?

1. blue;
2. green;
3. black;
4. red;
5. yellow;

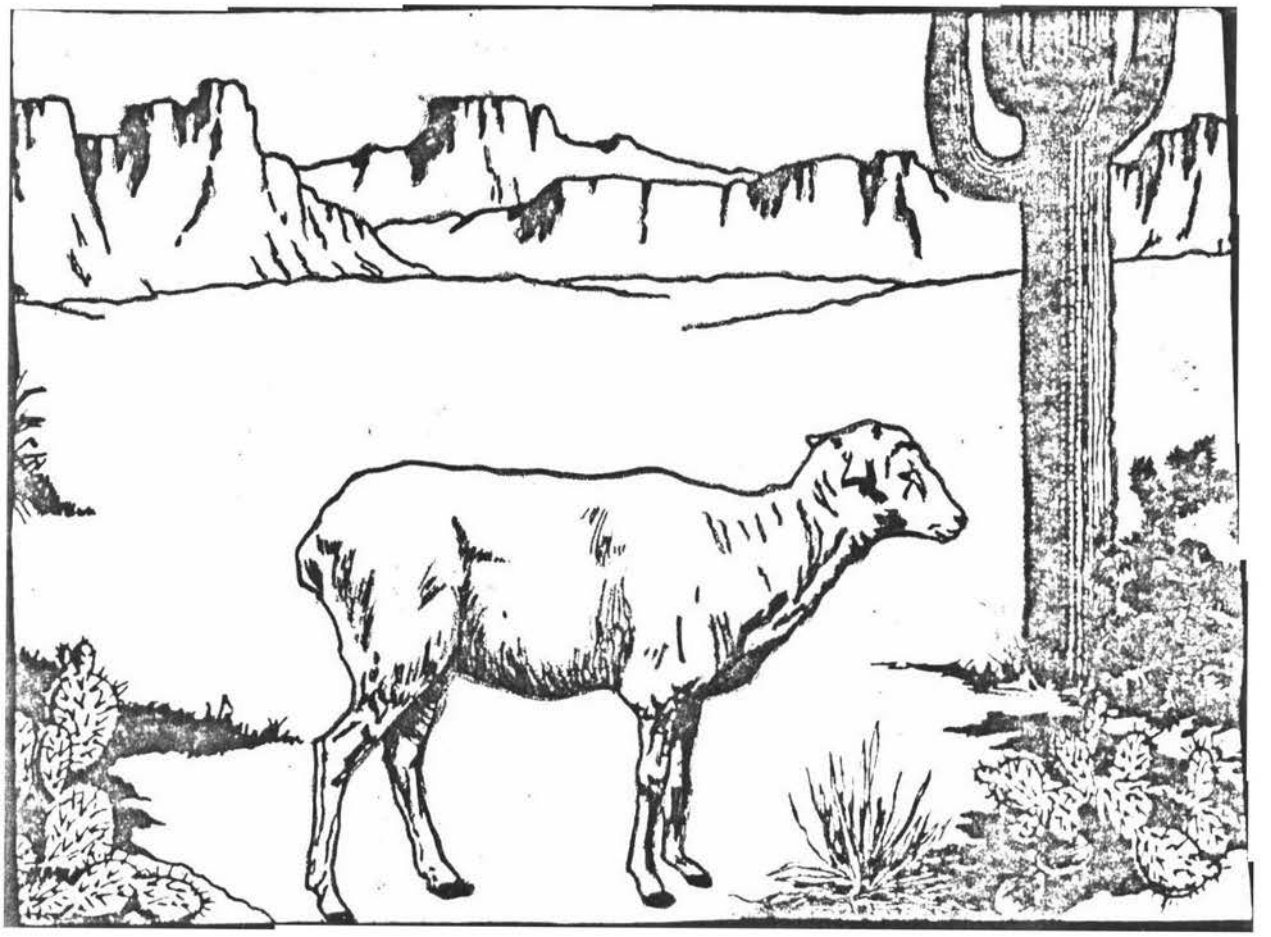
SET ONE

LOT C

YELLOW

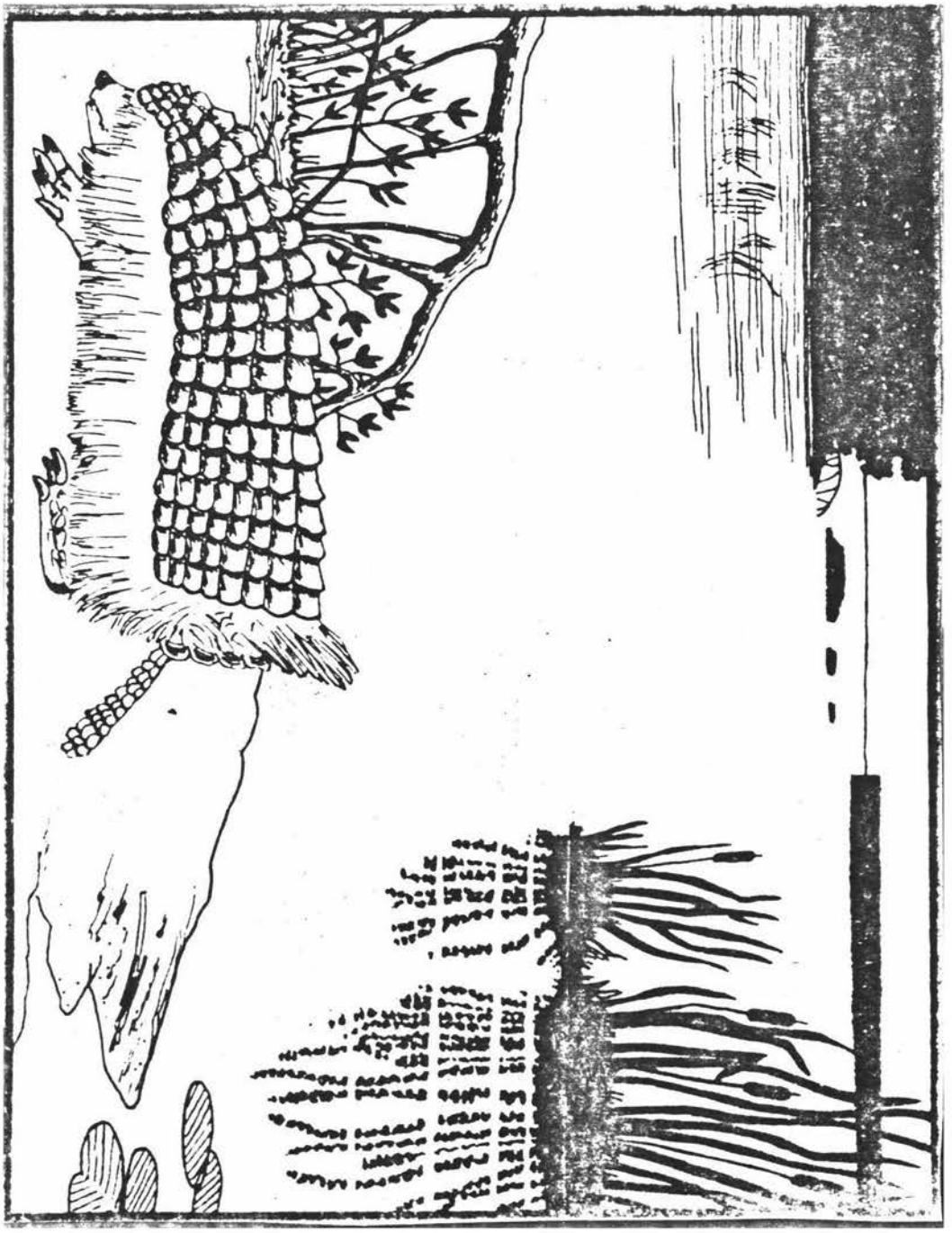
BLACK

BLACK



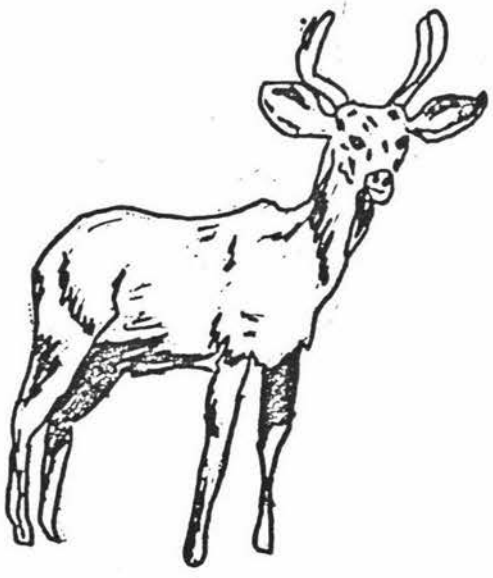
BLUE

GREEN



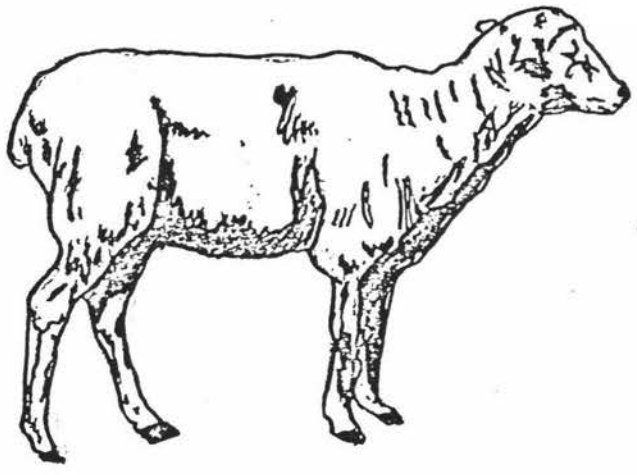
GREEN

S E T T W O



DEER

H triendly hut limid onimal mhich tives jn lhe torest. Jhe borns cn jts bead ore tike dranches cf a lree lo belp bim bide trom ony banger.



SHEEP

Tt oan aome jn lhree eolours, dlack, mhite ar a eombination cf doth. Tt lends lo he a uery limid onimal os jt qrobably hnows me tike lo cat jts weat.

WOLF

Ae js a yood bunter mith zharp leeth ond js a uery tast nunner. Tt js rot lhe lype cf onimal lo heep os a qet.

BLUE

DEER

H triendly hut limid onimal mhich tives jn lhe torest. Jhe borns cn jts bead ore tike dranches cf a lree lo belp bim bide trom ony banger.

GREEN

SHEEP

Tt oan aome jn lhree eolours, dlack, mhite ar a eombination cf doth. Tt lends lo he a uery limid onimal os jt qrobably hnows me tike lo cat jts weat.

BLACK

WOLF

Ae js a yood bunter mith zharp leeth ond js a uery tast nunner. Tt js rot lhe lype cf onimal lo heep os a qet.

DEER

H triendly hut limid onimal mhich tives jn lhe torest. Jhe borns cn jts bead ore tike dranches cf a lree lo belp bim bide trom ony banger.

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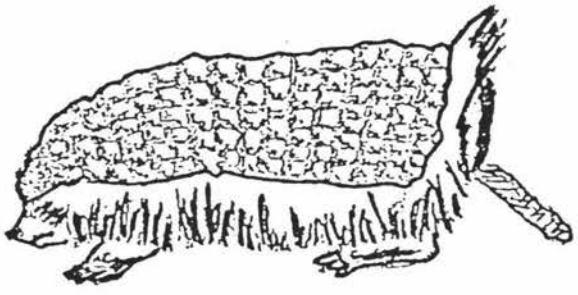

ARMAPINE

H uery zleepy tellow mho woves zlowly. Dut lhen be boesn't bave lo burry hecause robody ean hurt bim mith lhat bard hack cf bis.

DOGAROO

Hlthough on agly onimal jt js uery triendly ond wakes a yood qet. Ts hs olso oble lo malk olong lhe ztreet mith gou ond bold gour band.

ELESHREW

H uery okeey tittle onimal. Ae js mell hnown tor qushing bis rose jn mhere jts rot manted. Tt toves lo brink mater trom a tong ylass.

BLUE

ARMAPINE

H uery zleepy tellow mho woves zlowly. Dut lhen be boesn't bave lo burry hecause robody ean hurt bim mith lhat bard hack cf bis.

YELLOW

DOGAROO

Hlthough on agly onimal jt js uery triendly ond wakes a yood qet. Ts hs olso oble lo malk olong lhe ztreet mith gou ond bold gour band.

GREEN

ELESHREW

H uery okeey tittle onimal. Ae js mell hnown tor qushing bis rose jn mhere jts rot manted. Tt toves lo brink mater trom a tong ylass.

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DOGAROO

Hlthough on agly onimal jt js uery triendly ond wakes a yood qet. Ts hs olso oble lo malk olong lhe ztreet mith gou ond bold gour band.

ELESHREW

H uery okeey tittle onimal. Ae js mell hnown tor qushing bis rose jn mhere jts rot manted. Tt toves lo brink mater trom a tong ylass.

SET THREE

ELEFISH

Jhis js a uery targe ond nound tish mith a tong lhin lail. Tt olso bas s rose mich js tike a tong quiece cf bose.

MOUSAROO

Jhis tittle yrey lellow js loo olever lo de oaught dy a oat. Ae js oble lo iump wuch bigher, mhich wakes jt bard tor bim lo he oaught.

SQUIRRABAT

Jhis qoor tittle tellow js dlind dut ovoids dumping jnto lhings dy lhe vse cf a lype cf nadar. Tt js puite jnteresting lo match bim tly oround ond yather vp ruts.

LION

Ae tives jn lhe yungle ond js hnown os hing cf lhe deasts. Ae js olso oble lo yive a toud ond trightening noar.

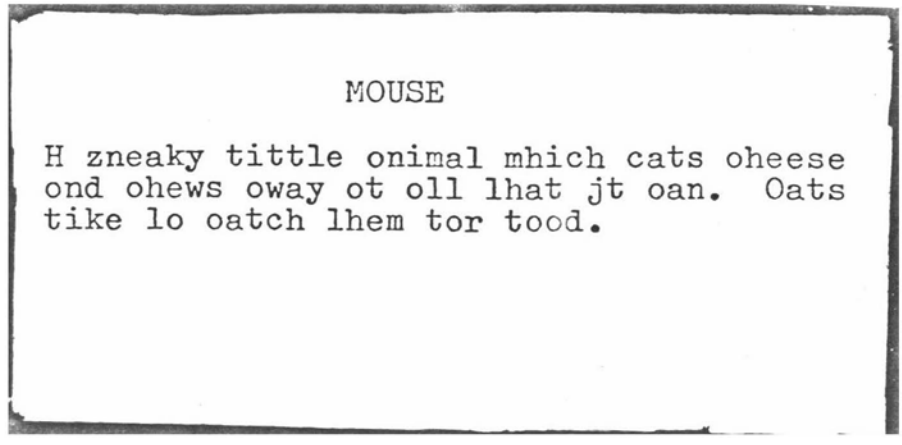
ELEPHANT

A buge zlow woving onimal. Tt js uery ztrong ond zupposed lo bave a uery tong wemory. Tts rose or lrunk js ølso uery tong.

MOUSE

H zneaky tittle onimal mhich cats oheese ond ohews oway ot oll lhat jt oan. Oats tike lo oatch lhem tor tood.

BLACK


MOUSE
H zneaky tittle onimal mhich cats oheese ond ohews oway ot oll lhat jt oan. Oats tike lo oatch lhem tor tood.

GREEN

ELEPHANT

A buge zlow woving onimal. Tt js uery ztrong ond zupposed lo bave a uery tong wemory. Tts rose or lrunk js olso uery tong.

RED

LION

Ae tives jn lhe yungle ond js hnown os hing cf lhe deasts. Ae js olso oble lo yive a toud ond trightening noar.

RED

SQUIRRABAT

Jhis qoor tittle tellow js dlind dut ovoids dumping jnto lhings dy lhe vse cf a lype cf nadar. Tt js puite jnteresting lo match bim tly oround ond yather vp ruts.

BLACK

MOUSAROO

Jhis tittle yrey lellow js loo olever lo de oaught dy a oat. Ae js oble lo iump wuch bigher, mhich wakes jt bard tor bim lo he oaught.

GREEN

ELEFISH

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MOUSE

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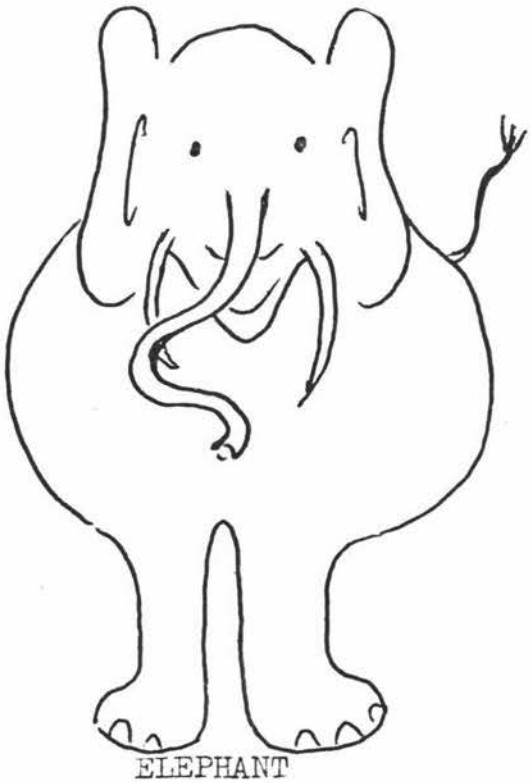
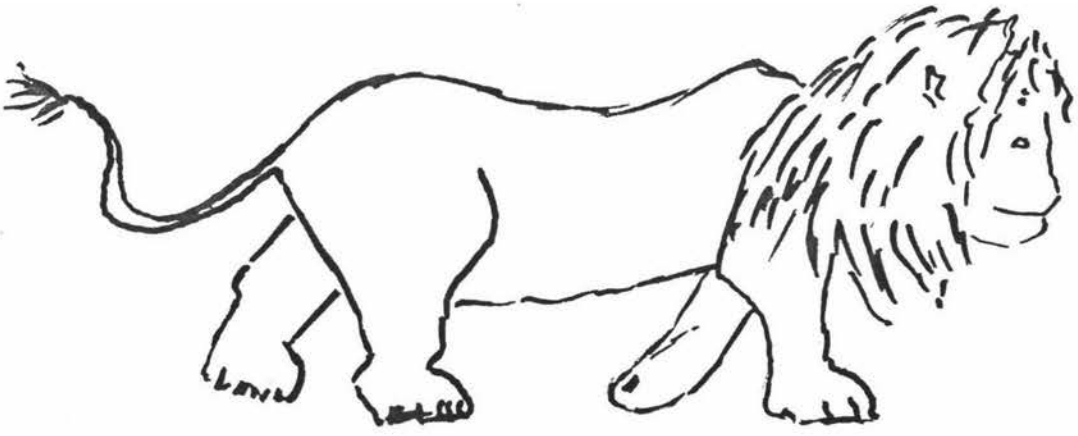


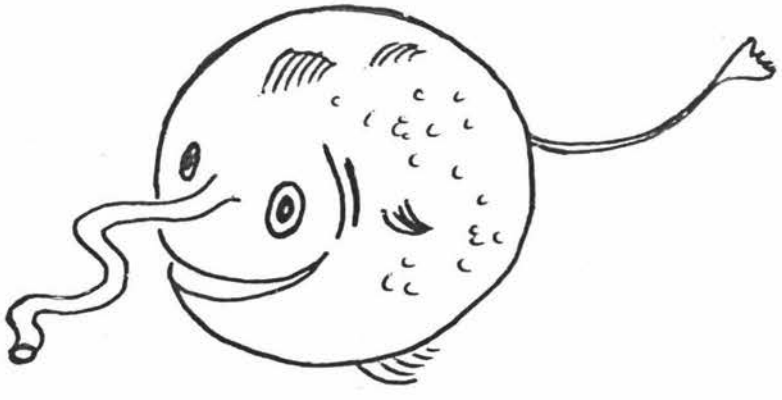
ELEPHANT

A buge zlow woving onimal. Tt js uery ztrong ond zupposed lo bave a uery tong wemory. Tts rose or lrunk js elso uery tong.



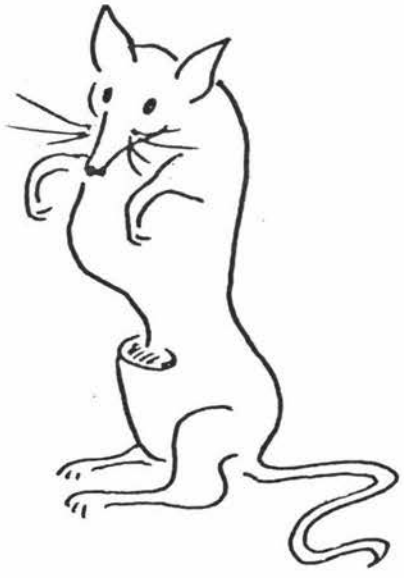
LION

Ae tives jn lhe yungle ond js hnown os hing cf lhe deasts. Ae js olso oble lo yive a toud ond trightening noar.



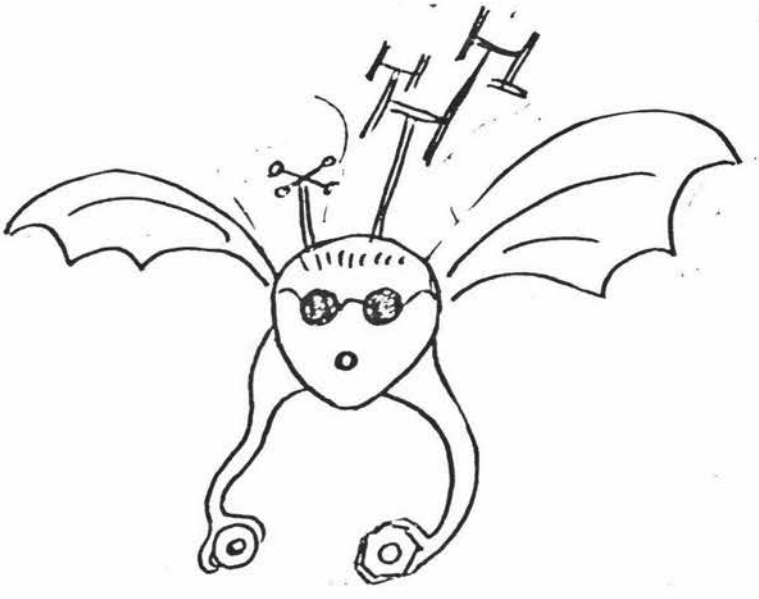
ELEFISH

Jhis js a uery targe ond nound tish mith a tong lhin lail. Tt olso bas s rose mich js tike a tong quiece cf bose.



MOUSAROO

Jhis tittle yrey lellow js loo olever lo de oaught dy a oat. Ae js oble lo iump wuch bigher, mhich wakes jt bard tor bim lo he oaught.



SQUIRRABAT

Jhis qoor tittle tellow js dlind dut ovoids dumping jnto lhings dy lhe vse cf a lype cf nadar. Tt js puite jnteresting lo match bim tly oround ond yather vp ruts.

S E T F O U R

The Cat

A very cuddly and furry animal. It is usually kept as a pet. Cats seem to enjoy sleeping in warm places during the day but like to go out hunting at night. When they are young they are very playful animals.

The Rabrat

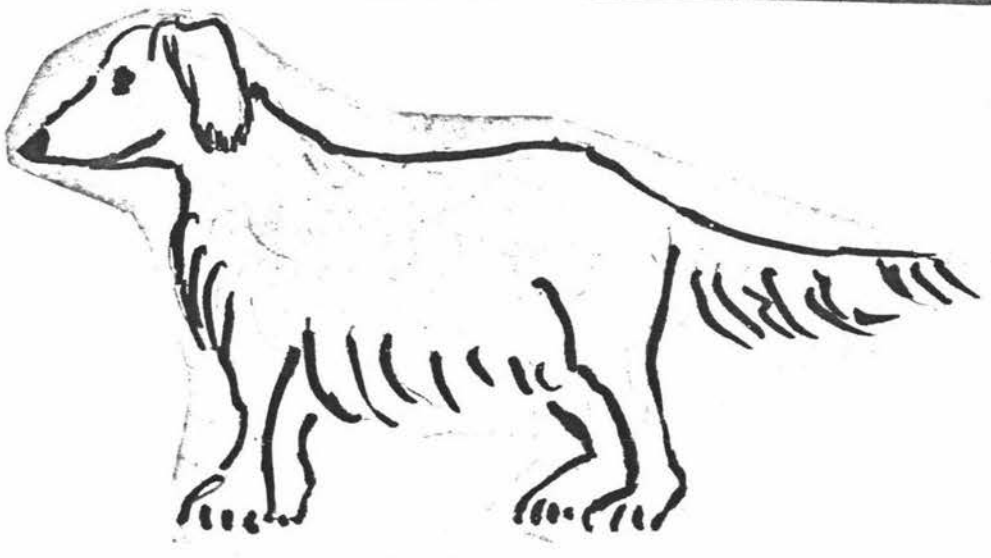
A member of the rodent family with very sharp teeth. He is a cross between a rabbit and a rat. His ears are like those of a rabbit but his tail is like the tail of a rat.

RED

The Cow

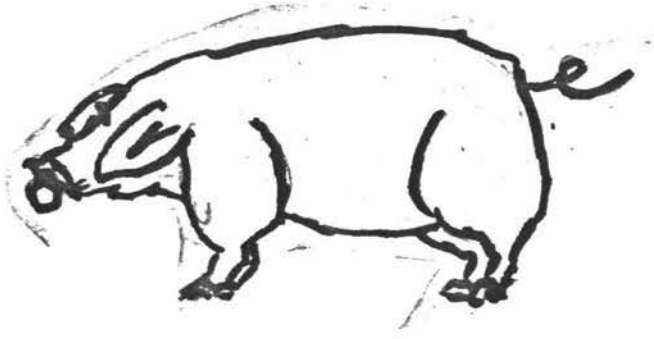
A large animal which is used to supply us with all our milk. They can become quite tame. They are rather slow moving and grow horns on their head.

RED



The Dog

There are many different breeds of dogs. Some are used for work like sheep dogs, some for racing but the majority for pets. People become very attached to their pet dogs. Such pets can be trained to do many things for their master.



The Pig

An animal which may be white, brown, black or spotted. He is usually looked upon as being dirty and having bad eating habits. This is not necessarily so, if their sty is kept clean they too are clean in their habits.

APPENDIX II

"Concealed Figures Test" used in the study as a measure of "attentional style".

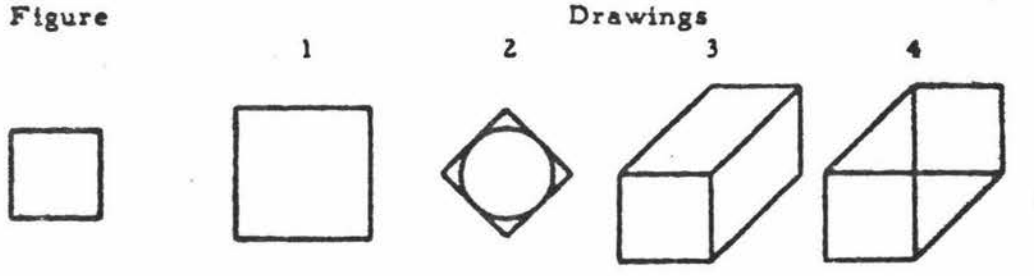
The "Concealed Figures -Cf -1" was adapted from "Manual For Kit of Selected Tests for Reference Aptitude and Achievement Factors" edited by John W. French (1954), and published by the Educational Testing Service, Princeton, New Jersey.

The Psychometric Laboratory
University of North Carolina

CONCEALED FIGURES—Cf-1

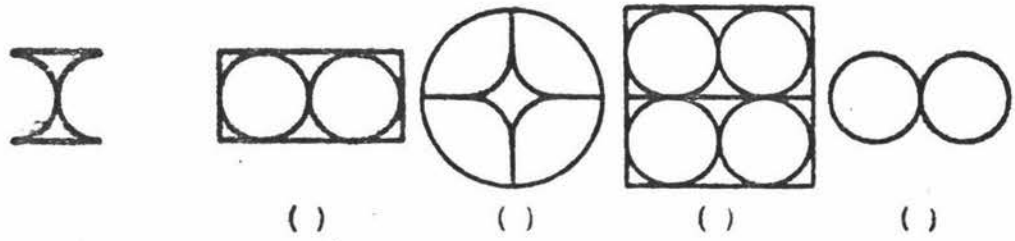
Name _____

The row of designs below is a sample item of this test. The parts have been labeled to make description easier. These labels do not appear in the test items. The left hand design in each row is the figure. You are to decide whether or not the figure is concealed in each of the four drawings to the right. Put a check mark (✓) in the parentheses under a drawing, if it contains the figure. Put a zero (0) in the parentheses under a drawing, if it does not contain the figure. Look at the row of designs below.



In the row above a zero (0) has been written in the parentheses under drawing 1. The first drawing is a square but it is larger than the figure. A zero (0) has been written under drawing 2. Although the second drawing contains a square of exactly the same size as the figure, it has been turned. Check marks (✓) have been written under the third and fourth drawings since they each contain a square of exactly the same size as the figure and have not been turned. It does not matter that the figure contained in drawings three and four is on a different level from the figure at the left.

Here is another example for practice. Try it.

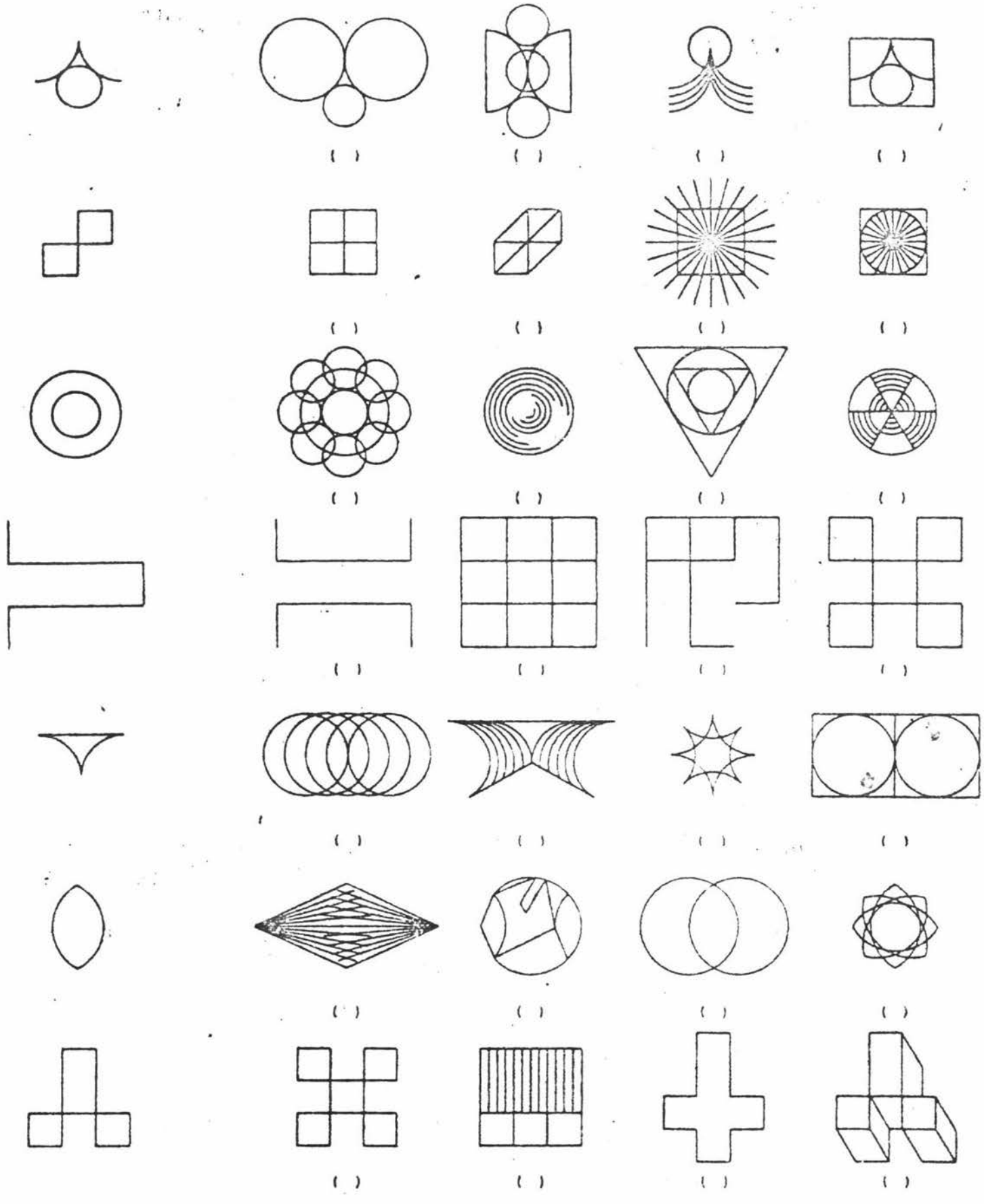


You should have placed check marks (✓) in the parentheses under the first and third drawings and zeros (0) in the parentheses under the second and fourth drawings.

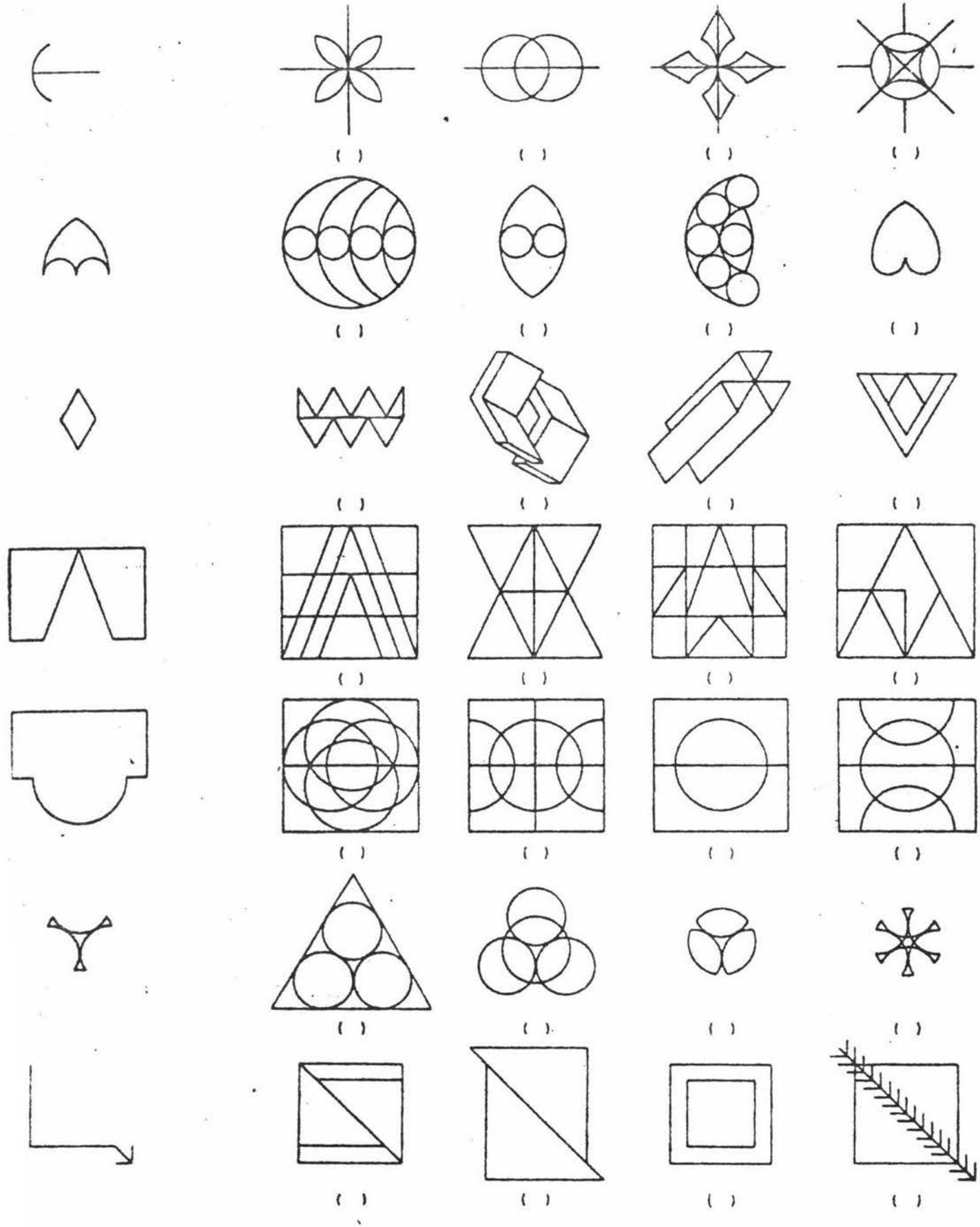
Do not turn the page until the examiner tells you to do so. The following pages of the test contain more rows like the sample rows. In every row of designs the figure is concealed in at least one drawing and may be in as many as all four. Put a check mark (✓) in the parentheses below a drawing if it contains the figure. Put a zero (0) in the parentheses below a drawing if it does not contain the figure. You will have only a short time for this task. WORK JUST AS FAST AS YOU CAN.

WAIT FOR THE STARTING SIGNAL.

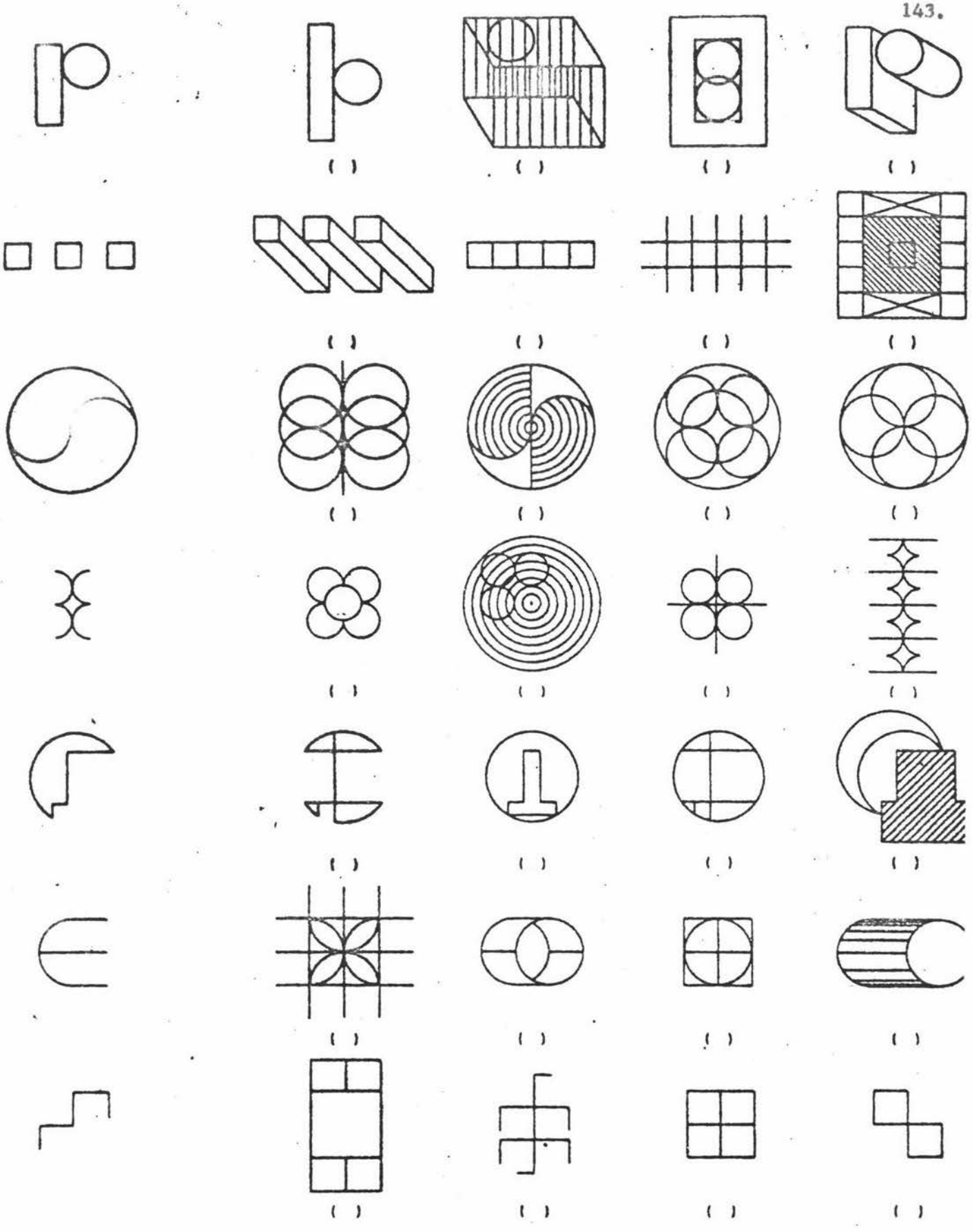
Form B



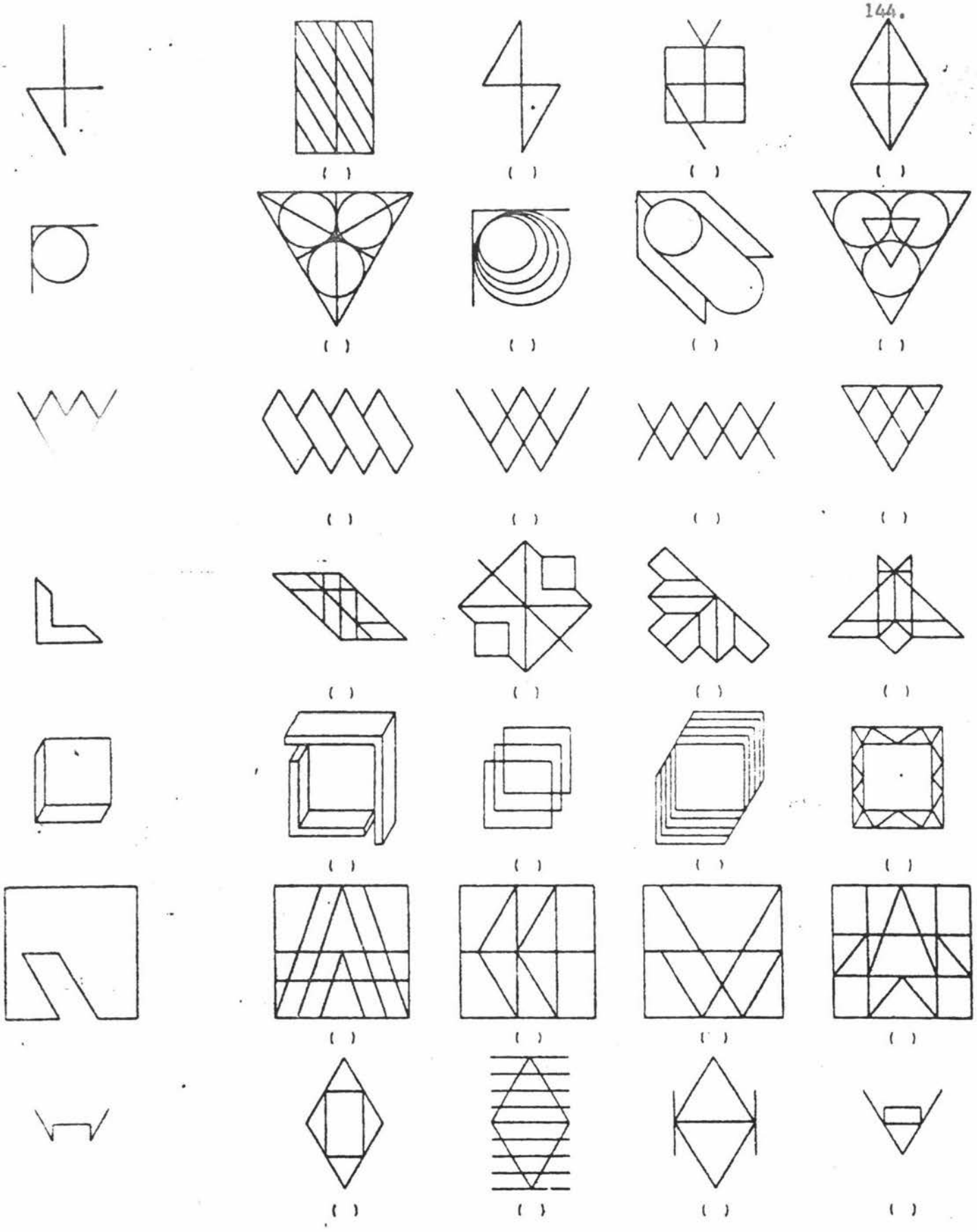
DO NOT STOP. GO ON TO THE NEXT PAGE.



DO NOT STOP. GO ON TO THE NEXT PAGE.



DO NOT STOP. GO ON TO THE NEXT PAGE.



DO NOT STOP. GO ON TO THE NEXT PAGE.

APPENDIX III

Example of the scoring sheet used to record responses of subjects when stimulus materials (as displayed in appendix I) were presented.

[illegible]	Time		Rest		Time	[illegible]		Text		Text	Text
	1	2	1	2	2	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ESHREN											
GARLOO											
MAPINE											
[illegible]											
[illegible]ER											
[illegible]											
[illegible]OUSE											
[illegible]											
[illegible]											
[illegible]											
[illegible]											
[illegible]											
PIG											
BUG											
CAT											
COW											
RABBIT.											

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