LAKEHEAD UNIVERSITY

AN INVESTIGATION OF THE ROLE

OF INDIVIDUAL WORDS, IN THE COMPREHENSION OF CONNECTED DISCOURSE

by

ROBERT JOHN FALTIN

A THESIS

SUBMITTED TO THE FACULTY OF ARTS

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR

THE DEGREE OF MASTER OF ARTS

DEPARTMENT OF PSYCHOLOGY

THUNDER BAY, ONTARIO, CANADA

MAY, 1973

ProQuest Number: 10611201

ProQuest 10611201

Copyright © 1973 Robert John Faltin

ACKNOWLEDGEMENTS

ABSTRACT

Two experiments exploring the role of individual words in reading comprehension are reported. In the first experiment one group of subjects processed text for comprehension and another attempted retention of text words. Results showed that higher comprehension level can be accompanied by lesser knowledge of text words, and increased text word familiarity by decreased comprehension of the material. The second experiment presented subjects with a series of texts in which nouns representing the topic or "Actor" were deleted. Its results showed that subjects can successfully fill-in such words and that the group showing superior performance in this task generated a significantly higher level of text comprehension than a comparable low performance group. No differences between the high and low groups in terms of retention of random text words were found. Experimental results are discussed in relation to reading as a whole, and it is concluded that word retention and text comprehension are different processes, and that individual word quantification data may not be particularly relevant to comprehension analysis. Suggestions for further research are presented.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

INTRODUCTION

The present investigation concerns itself with an examination of the role played by different word types in reading comprehension. More specifically, the two reported experiments explore the quantitative relationship between text word retention and comprehension level, and the relationship between success in inferring the identity of a specific word type, and comprehension.

Contemporary research into reading appears to be enlarging its experimental emphasis from consideration of problems specific to the reading process, such as pattern recognition and grapheme to sound translation, to attributes which reading has in common with other cognitive processes like perception, memory, and problem solving. A concomitant shift away from the study of the behaviour of beginners to that of skilled readers is also in evidence (Brown, 1970). In accord with this trend the present investigation accepts Neisser's (1967) description of reading as "externally guided thinking" (p.136), and attempts to explore the characteristics of the relationship between the "thinking" and the "guide" through a study of the connection between familiarity with the text itself and corresponding comprehension level.

IDENTIFICATION

The study of component parts of the reading process is organized under two headings, "identification", and "comprehension" (Wiener and Cromer,1967; Bugelski,1971). The term "identification" is used in reference to the decoding of text, the act of conversion of visually perceived shapes into vocalizations or other internally useful specifications where no consideration of context or meaning takes place. Examples of "pure" identification are the decoding and vocalization of words from a language foreign to the reader, and the sounding out of individual letters.

Currently popular are explanatory models of identification based on the concept of "feature analysis" (Neisser,1967). Their main premise is that the reader is able to detect a certain number of significant differences in the visual stimulus and that he makes his decision as to the identity of the particular stimulus on the basis of as few of these detectable differences or "features" as possible.

Neisser (1967) proposed that the possible constituents of features may include the presence or absence of closed loops, intersections, straight lines, vertical or horizontal discontinuities, symetricity, and curvature. The finding that the letter "Z" is harder to detect in lines like AWKLNMVTXWEYLHFKYXTZHWXM than lines like OPDCRUBSDQPURDCOZQGPBUSQ (Neisser,1967) may, accordingly, be due to the fact that in the former line many of

the figural attributes of "Z" are shared by other letters while in the latter line "Z" is the only member lacking curvature.

The term "word apprehension effect" was used by Woodworth (1938) to describe the finding that during tachistoscopic presentation subjects are able to recognize and retain more of the stimulus letters if those letters form a word than if they do not. The "word apprehension effect" implied that skilled subjects handle letters in familiar words differently than they handle letters in isolation; an interpretation which nas been supported by more recent research (Reicher,1969, Wheeler, 1971).

The feature analytic approach, as represented by Neisser (1967) and Gibson (1969), rests on the belief that experience allows skilled readers to synthesize entities larger than individual letters on the basis of an encounter with a particular conglomeration of features. The skilled reader is believed to use visual attributes of a familiar word like "school" to synthesize a wholistic entity rather than a sequence of the separate letters of which the word "school" is composed.

The synthetic aspects of the feature analytic approach help us to understand the facility with which skilled readers can process mutilated or irregular material. A large element, such as a word, can be expected to have a far greater number of identifiable features than an individual letter, and a word

may consequently be identifiable when some or all of its constituent letters are not. An experimental demonstration of this effect was provided by Kolers (1970) who found that word-forming letter sequences can be successfully identified during tachistoscopic presentations which are too short for the identification of the individual letters.

Neisser (1967) described identification in skilled readers as "pre-attentive", requiring no investment of focal attention. Studies, such as those reported by Stein and Solomons (1969), have shown that text processing which takes place while the subject's attention is invested in distractor tasks is characterized by errors which are inconsistent with the meaning and thought flow of the text, such as inappropriate pronunciation of words with ambiguous tense. Errors in normal, attentive reading, on the other hand, tend to preserve that meaning and thought flow (Thorndike, 1917). Such findings suggest that inattentive text processing by skilled subjects is the equivalent of a vocalized excercise in automatized identification, and consequently immune to constraints of grammar and meaning.

In discussing the differences between skilled and unskilled readers, and the effects of practice on the processes involved in identification Gibson (1971) wrote:"Word perception, like other kinds of perception, is active searching for the relevant information in stimulation. Perceptual learning with words, like other

examples of perceptual learning, develops toward the strategy

that is most economical. This means that priorities for features

shift adaptively, with practice in a task, toward those that

have the most utility for it " (p.365). According to Smith (1971):

"The skilled reader needs no more visual information to identi-

fy a string of words than the beginner needs to identify a couple

of letters because all the additional information that the skil-

led reader requires is contributed by his prior knowledge of the

language " (p.102).

Identification, as practiced by beginners, appears to con-

sist of attentive use of detectable text features for the pur-

pose of synthesis of small entities such as letters or "spelling

patterns" (Gibson,1969). Skilled readers, on the other hand, tend

to "automatize" (Nash, 1970) the identification process, and deal

with text as economically as possible through the synthesis of

large entities on the basis of a small quantity of features.

COMPREHENSION

Comprehension is generally considered an act of attentive

updating of the subject's available knowledge of a particular

topic on the basis of newly processed material, or the criticism

and interpretation of the new material on the basis of previous

knowledge. Comprehension was defined by Wilson, Robeck, and Michael

(1969) as an " Intellectual process involving interpretation, translation, and extrapolation " (p.568), and by Wiener and Cromer (1967) as " the ability of the reader to paraphrase, to abstract the contents, to answer questions about the material, or to deal critically with the contents " (p.621).

The following factors are often mentioned in connection with success in reading comprehension. First, the reader needs to be familiar with the notation used in the text, he must be a skilled reader who has automatized identification to the point where attention can be directed elsewhere, namely to meaning (Neisser, 1967). Secondly, the subject needs to have attained a level of cognitive development where he can use symbols in logical operations, and can evaluate the possible and the potential outcomes of symbolically represented events (Singer, 1969). Thirdly, since words cannot be considered self-explanatory information packages but rather arbitrary labels independent of the referent entity or process, the reader must already be familiar with the rudiments of their applicability and with the general properties of their referents (Langer, 1951, Cherry,1964, Black, 1968). Fourthly, the subject needs to be skilled in the use of these symbols in linear arrangements and familiar with the requirements of the grammar of his particular language (Chomsky, 1966).

Comprehension is different from verbatim storage in that it is characterized by the adaptation and change of the stimulus material. One of the numerous experiments demonstrating this effect was reported by Kolers (1970) who showed that bilingual subjects presented with a meaningful text consisting of a mixture of French and English phrases tended to retain information provided in the text but, upon recall, often mixed media by reporting the originally English phrases in French, and vice versa. Bransford and Franks (1971) reported similar results from an experiment where readers were exposed to simple declaratives such as "the boy hit the ball", "the ball is red", and "the boy is tall". After performing some diversionary tasks subjects tended to recall the original material in the form "the tall boy hit the red ball".

The adaptation and transformation of the text was hypothesized to be due to the fact that comprehension is a constructive, rather than a retentive process, where the reader makes use of previous knowledge to arrive at the final product. Smith (1971) proposed that " the perceiver brings a highly structured knowledge of the world into every perceptual situation. Rather than say that he discovers order and regularities that are properties of the environment, it is more appropriate to say that the perceiver imposes his own organization upon information that reaches his receptor systems " (p.187).

Comprehension is also different from verbatim storage in the amount of material to which it can be applied. As Hunt (1971) pointed out, verbatim recall is limited to one or two sentences while comprehension can encompass a great deal more. The reason is, according to Hunt, that in comprehension the incoming material is processed through a "distributed memory" system in which information becomes first available to a "buffer" where it is analysed and compared to information and structure from long term storage. Relevant and novel content is considered for long term storage while the redundant aspects of the message are not retained.

For the skilled subject, redundancy includes the identity of the words which are used, as well as details of the surface structure decoding process. Hunt (1971) proposed that message interpretation involves the specification of the "Actor" and "Action", and that the remaining information is synthesized around this centre into a "cognitive unit".

Differences in reading comprehension between beginners and skilled subjects shows some relationship to the differences found between these two groups in identification. Smith (1971) wrote: "This difference between fluent and beginning reading may be epitomized in the manner in which the reader makes use of syntax, the bridge between surface structure and meaning. The fluent reader can be regarded as crossing the bridge from the meaning side, merely sampling the visual information to conform to his expectations.

... The beginning reader, however, spends most of his time cros-
sing the bridge of syntax in the opposite direction. Rather than
predict surface structure from meaning, which requires only a
minimum of visual information, he must deduce meaning from surface
structure " (p.221).

The Quantitative Approach to the Study of Comprehension

From a strictly empirical point of view the foregoing descrip-
tion of reading may be considered unmanagible because many of the
variables described are unquantifiable and subjective. Developments
in computer technology, communications engineering, and behaviour-
istic psychology which took place in the last three decades stimu-
lated the growth of an alternate approach to reading which has as
one of its aims the duplication and simulation of reading in mathe-
matical and machine terms (Bar-Hillel, 1953).

Quantitative approaches are characterized by reliance on the
measurement of the only directly observable variables, the text or
linguistic communication itself. In dealing with identification
these approaches tend to employ a "template matching" model which
is based on the assumption that text letters are decoded through
comparison or "matching" with shapes or "templates" found in the
reader's repertoire (Neisser, 1967; Terwilliger, 1968).

Osgood (1969) proposed that individual words are to be considered "bundles of characteristics" and comprehension the process of "fusion" of those separate characteristics into a whole (Osgood, Suci, and Tannenbaum, 1957). One method of ascertaining the nature of those "bundles of characteristics" was reported by Osgood (1964) and relied on asking subjects to place various words into categorial dimensions ranging from "active" to "passive", "strong" to "weak", "good" to "bad", and so on. Another quantification technique was developed by Noble (1952) and consisted of measuring the number of associative responses individual words elicit, and using that result as an indicator of the "meaningfulness" of the words.

Data obtained from such quantification procedures are compiled into lists of words followed by numerical descriptions (Snider and Osgood, 1969) which are used in attempts at the duplication of human reading comprehension through the calculation of the "meaning" of word groups and combinations (Cliff, 1959; Gerbner, Holsti, Krippendorff,Paisley, and Stone, 1969).

THE PRESENT INVESTIGATION

In tabulating the attributes of individual words and attempting the cumulation of their numerical representations the adherents of the quantitative approach indicate their belief that the only determinants of comprehension are to be found in the text itself, and that words have the same role and importance individually and in context (Osgood, 1956,1963,1964,1968; Osgood et.al. 1957). The implication of these assumptions is that the greater a subject's familiarity with the words in a particular text the greater his comprehension of that text will be, and that factors external to the text itself can not contribute measurably to its comprehension.

An opposite set of predictions is suggested by the views of Goodman (1967), Neisser (1967), Kolers (1970), Hunt (1971) and Smith (1971) who share the belief that the subject takes an active part in comprehension, and that word retention and text comprehension are fundamentally different.

The two experiments to be reported attempt to explore the relationship between familiarity with individual text words and text comprehension and attempt to evaluate the contribution of the subject and his knowledge to the comprehension process.

EXPERIMENT ONE

The aim of experiment one was to explore the relationship between the subject's ability to recognize words previously encountered in a stimulus text, and his level of comprehension of that text. Subjects in this experiment were presented with a series of short informative texts followed by comprehension and word recognition questions. One group of subjects was rewarded for correct answers to the comprehension questions, the other was rewarded for correct answers to the word recognition questions.

Subjects were required to provide answers to all questions to the best of their ability, and a control task was included in each sequence so that the diligence with which subjects answered the non-rewarded questions may be evaluated. A reward for fast reading was also employed; its aim was to discourage reprocessing of the text.

The subjects were expected to attempt to maximize their earnings by reading the text as quickly as possible, and in such a way as may be most useful in correctly answering their respective rewarded questions. They were also expected to faithfully report their available knowledge of the non-rewarded tasks. The experimental hypothesis postulated that comprehension and text word retention are fundamentally different and that success in

one of the tasks need not be reflected in the other.

Method

Subjects

All subjects were undergraduate students participating in
the experiment to earn credits for an introductory psychology
course. Of an original 70 subjects three were rejected due to
substandard performance in the control task and one was elimi-
nated due to his failure to comprehend instructions. The re-
maining 66 subjects were randomly assigned into two groups of
33.

Materials

The 17 paragraphs used in this experiment were chosen from
the Iowa Silent Reading Test and the Emporia Silent Reading Test.
Each paragraph was presented on a separate page and followed on
the next page by three sets of questions. These sets of questions
were arranged in rows, separated in terms of type, but not speci-
fically labelled as testing any particular function (see Appendix
A).

Row one contained three comprehension questions provided by
the source of the experimental texts, and row two contained an
arithmetical problem chosen from a grade six achievement test.
Row three consisted of three text word recognition questions where
words constituting the correct alternative were chosen from the

stimulus paragraph and the distractor items were commonly used words chosen from a dictionary.

The 17 paragraphs and their respective pages of questions were arranges into booklet form where they were prefaced by instructions and followed by a post-experimental questionnaire inquiring into the subject's understanding of instructions, the reading style used by him in this experiment, and his interpretation of experimental goals. (Appendix A contains all materials used in experiment one, a description of relevant pilot studies, and a further discussion of some methodological and statistical issues).

Procedure

All subjects were run individually. At the beginning of the session each subject was randomly assigned into one of the experimental groups and provided with appropriate instructions. After reading the first paragraph subjects were paid one cent for every second by which their reading time fell short of 25 seconds. Upon completion of the questions following that paragraph, subjects in group one were paid two cents for every correct answer to comprehension questions and subjects in group two were paid two cents for every correct answer to word recognition questions. This procedure was followed in all 17 paragraph and question sequences. Subjects concluded the session with the filling-in of the post-experimental questionnaire.

Results

In order that subjects be provided with sufficient practice to develop an appropriate reading style only the scores from the last ten sets of comprehension and word recognition questions were used in the calculation of results. Control task and reading time data are based on the last 15 sets.

Table 1 presents the scores generated by the two experimental groups and tabulates the differences in performance in terms of two tailed t-tests for independent means.

TABLE 1

Analysis of Results:

Experiment One

	GROUP ONE		GROUP TWO				
	mean	SD	mean	SD	t	P	df
Comprehension	24.67	2.98	22.03	3.89	3.07	< 0.01	64
Word Recognition	16.27	2.91	18.21	3.41	2.48	< 0.01	64
Control Task	13.67	1.19	13.55	1.12	0.41	> 0.05	64
Time Under Limit	61.27	35.86	46.00	29.28	1.89	> 0.05	64

Table 1 shows that the reading time of the two groups did not differ significantly, nor did performance in the control task, the arithmetical problems. As a consequence it is reasonable to consider

the two groups unbiased samples of the experimental population.

Group one performed significantly better in terms of text comprehension, and group two performed significantly better in text word recognition. These results indicate that familiarity with the words occurring in a text and comprehension of that text cannot be considered synonymous, and suggest that reading comprehension is not likely to consist of simple storage of surface structure elements.

EXPERIMENT TWO

The foregoing experiment explored the general relationship between the subject's ability to recognize text words and his comprehension level. Experiment two continues investigation of this problem by measuring the effect which the availability of a specific type of surface structure unit has on text comprehension. That unit is one labelled "Actor" by Hunt (1971) and refers to the main element of a particular cognitive act, the topic or main concern of a sentence, phrase, or paragraph. The word "pencil" constitutes this type of element in a paragraph about the usage of pencils, the word "pin" is the "Actor" or main element in a paragraph about the history of pins, and so on.

Experiment two presented skilled readers with a number of short paragraphs where the main element was replaced by "X", and its synonyms, if any, by "Y", and "Z". The paragraphs consisted of descriptions of either the characteristics or the functions and uses of "X" and were followed by comprehension questions which inquired into these characteristics and uses. The specific identity of "X" was never requested in the comprehension questions, where the symbols "X", "Y", and "Z" were still used.

The example paragraph reads:

A X makes a mark when the surface on
which it is scratched is rough and hard enough
to wear off part of the lead. A X will not
write on a pane of glass because it is so smooth
that the X will glide over the surface. It
will not write on anything very soft, because
it will not wear off enough of the lead to make
a mark. When in use, a X keeps getting shorter
and shorter, because part of the lead is being
left on the paper.

The comprehension questions following this text read:

A) Choose the best title for the paragraph:
1. How a X is made, 2. How a X writes
3. Writing on a hard surface.

B) Why is it difficult to write on a pane of
glass with a lead X ?
1. Glass is too smooth, 2. X is too hard
3. Lead is too soft.

C) The lead in a X wears down faster when
writing on
1. Pane of glass, 2. Sheet of smooth white paper
3. Piece of wrapping paper.

As in the example, all comprehension questions in experiment two could potentially be answered without any knowledge of the identity of "X". The primary aim of this experiment was to determine whether the subject's ability to infer the identity of "X" somehow relates to his level of comprehension of the paragraph.

The experimental hypothesis proposed that the symbols "X", "Y", and "Z" in themselves fail to specify the needed conceptual category for integration of the material (Hunt, 1971), and that,

unless the reader himself is able to infer the identity of the "Actor" (or develop a whole new cognitive category for each symbol), little comprehension and retention of relevant content will take place. The experimental hypothesis proposed that a <u>correct</u> inference of the identity of "X" will lead to superior comprehension of the text than an incorrect one, since the former will to a greater extent facilitate the integration and retention of the information provided in the paragraph.

Along with the above mentioned questions, experiment two employed a number of arithmetical problems which served as a control measure for the purpose of elimination of careless and unmotivated subjects. The experiment also provided three text word recognition questions whose function was to determine whether retention of text words relates to a greater or lesser extent with the ability to specify the identity of "X" than does text comprehension.

The last question pertaining to each of the paragraphs was presented on a separate page and provided the subject with six alternatives from which to choose the identity of "X". In the example paragraph these alternatives were: 1. wire, 2. pencil, 3. lipstick, 4. needle, 5. ball, and 6. quill.

The five distractor items in this last question were not randomly chosen words but rather terms which were generally plausible substitutes for "X", but which were inappropriate for one

or more reasons evident from a careful scrutiny of the source paragraph. Randomly chosen words could not be used in this instance because they were too easily seen as inappropriate, and, as a pilot study showed (see Appendix B), were never selected by any of the subjects.

Method

Subjects

The 42 subjects participating in experiment two were undergraduate students who voluntered in order to receive credit in an introductory psychology course. None was rejected on the basis of performance in the control task.

Materials

The sixteen source paragraphs were selected from the Emporia Silent Reading Test and the Iowa Silent Reading Test. The word constituting the main element or "Actor" in each of these paragraphs was deleted and replaced with "X", its synonyms, and words describing its class or category, it any, were replaced by "Y", and "Z".

Each of these paragraphs was presented on a separate page, and each was followed by three comprehension questions (obtained from the same source as the paragraphs), an arithmetical problem, and three word recognition questions. The comprehension questions

were also modified by the removal of "Actor" words and synonyms and the substitution of appropriate symbols. The arithmetical problem and the three word recognition questions were identical to those employed in experiment one. Each of the word recognition questions asked the subject to choose one word which occurred in the paragraph from three or four alternatives, as dictated by the source materials. "Actor" words were not used in these questions.

The following page presented subjects with the problem of choosing the main element or "Actor" of the previous paragraph from a set of six alternatives. The five distractor items in each set were chosen in a manner which would lead to a reasonable number of errors. Where the paragraph discussed the geographical features of a certain region the alternatives to the correct answer were geographical or spatial entities which differed in a specifically mentioned detail from the area whose characteristics were given. When the source paragraph described technological developments or inventions the distractor items were inventions or developments unsuitable for dimensional, historical, or other specifically mentioned reasons evident from the paragraph.

These materials were bound into a booklet consisting of instructions, an example, and 15 paragraphs, each on a separate page and accompanied by two pages of questions (see Appendix B).

Procedure

Subjects were run individually, and all received identical instructions and materials. The instructions stressed the importance of fast processing of the text, and of answering all questions in the order in which they were given (see Appendix B). Feedback was provided at the end of the experimental session.

Results

The answers to questions accompanying the example paragraph were not considered in the calculation of results. Scores from the remaining 15 sets of questions were combined into **success** sums for "Actor" inference, comprehension, word recognition, and the control task for each of the subjects.

Table 2 compares the scores of the 42 subjects to results which would be expected if the basis for choice of alternatives in the three experimental tasks were random. The "expected" values were the number of questions in a set divided by the number of alternatives per question. These were compared to "observed" values consisting of the sum of the individual subject's correct answers in a particular set. Since the control task consisted of open-ended questions no meaningful "expected" success rate based on random responses could be calculated for it.

TABLE 2

Comparison of Observed Results

to Random Performance by means

of a χ^2 Test

	average of "observed" values	"expected" values	χ^2	df	P
"Actor" Inference	12.905	2.500	1853.00	41	< 0.01
Comprehension	33.786	14.377	1130.17	41	< 0.01
Word Recognition	26.785	14.377	497.19	41	< 0.01

As Table 2 shows, the levels of performance in all three experimental tasks were well above chance level.

One of the functions of experiment two was to evaluate the nature of the relationship between sucess in "Actor" inference and performance in the other tasks. To achieve this goal the total pool of 42 subjects was divided into three groups according to performance in the "Actor" inference task. The first group consisted of 15 subjects whose score was 14 or higher, the second group of 15 subjects with scores of 12 or less, and the third group, which was discarded from further consideration, consisted of 12 subjects whose "Actor" inference score was 13.

Table 3 compares the performance of the High and Low "Actor" inference groups along the variables of comprehension, text word recognition, and control. Two-tailed t-tests for independent means are used.

TABLE 3

Comparison of High and

Low Group Performance

	High Group		Low Group				
	mean	SD	mean	SD	t	df	P
Comprehension	34.80	2.96	32.00	3.48	2.37	28	< 0.05
Word Recognition	26.47	5.49	26.33	2.72	0.08	28	> 0.05
Control Task	14.06	1.03	14.00	1.19	0.16	28	> 0.05

The results presented in Table 3 show that the paragraph comprehension level of subjects in the High "Actor" inference group was significantly higher than the comprehension of subjects in the Low group. No significant differences in performance in text word recognition and the control task were found.

A joint consideration of the results presented in tables 2 and 3 suggests that subjects filled in the deleted "Actor" words on a basis other than chance, and that subjects who were superior in this task also possessed higher levels of text comprehension.

DISCUSSION

The purpose of the present investigation was to explore the function of individual text words in reading comprehension, and to relate the findings to contemporary interpretations of the reading process as a whole. The first experiment concerned itself with an examination of the relationship between the subject's ability to recognize words which occured in a stimulus text, and his comprehension of that text. The experimental materials consisted of connected discourse in the form of informative paragraphs about 65 words long which the subjects in one group were instructed to read for comprehension, and subjects in another group processed with the goal of retention of content words.

The results showed that success in one of these tasks can be achieved in conjunction with inferior performance in the other task. Subjects in the group rewarded for comprehension generated significantly higher comprehension levels while showing significantly lower text word recognition performance than subjects in the second group, which was rewarded for text word recognition. These findings can be interpreted to mean that in normal comprehension-oriented reading the identity of text words and the meaning of the passage are processed in different ways.

Kolers (1970) wrote: " the skilled reader recognizes the grammatical relations and reads the meanings directly from the words within a language, he does not read the words themselves" (p.116). A similar viewpoint was expressed by Begg and Paivio (1969) : " under natural conditions subjects rely exclusively on the imaginal representations of concrete sentences, thereby losing the individual words completely " (p.822).

According to Smith (1971): " the most effective strategy (for reading) would obviously be to transform the visual information from four or five words into larger meaning units at the deep structure level before commiting them to long-term storage. If this strategy is followed, the reader will be much more successful in reading for sense, even though he may not be able to recall the exact words " (p.200).

Polanyi (1967) further suggested that information gathered from explicit attendance to individual or isolated words is useless when understanding is the goal of reading, and that " the meaningful use of a word, which causes it to lose its bodily character, makes us look through the word at its meaning " (p.304). That is, if a word is to contribute to comprehension of connected discourse its meaning, and not its identity, must be retained.

Bugelski (1971), Hunt (1971) and Paivio and Okovita (1971) have proposed that the verbalization produced by subjects in describing their comprehension of connected discourse is a product of the reconstruction of the " spatial image " (Begg, 1971) or some other central representation of the meaning of that passage, rather than an attempt at retrieval of the remains of stored surface structure. Experiment one supported this viewpoint by showing that text comprehension and the amount of storage of content words are not directly related.

The "semantic differential technique" described by Osgood (1964) and Snider and Osgood (1969) is based on the quantification of individual words along a series of dimensions, and its data is generated through the subject's explicit focal consideration of isolated words. Osgood (1963, 1964, 1969) proposed that this technique generates results relevant to the study of word combinations, the comprehension of connected discourse and communication in general. The outcome of experiment one suggested that this may not be the case by showing that focal attendance to individual text words and success in their retention do not relate directly to the level of text comprehension.

Experiment two presented subjects with paragraphs in which nouns representing the main element or topic were deleted. Its

aim was to determine whether reading comprehension can be considered strictly a product of the text on which it is based or whether the reader himself contributes measurably to the comprehension process. This aim was pursued through measurement of the level of sucess in filling-in the identity of the deleted words, and an evaluation of the relevance of this success to text comprehension level.

An evaluation of performance level in the "Actor" inference task showed that subjects filled in the identity of this word at levels significantly above chance. Since the identity of the deleted word was not available from the text itself, in the sense that the letters of which it was composed could not have been discerned from the remaining text, it must have been supplied by the reader on the basis of his previous knowledge of that word's identity and applicability. This conclusion appears to be supported by the fact that high "Actor" inference performance tended to be accompanied by increased comprehension of the whole text.

The results of experiment two indicate that text comprehension need not be based exclusively on the words which actually appear in a particular discourse, but that the skilled reader's previous knowledge, his familiarity with the topic, or general linguistic ability can play a demonstrable role in influencing comprehension level.

Black (1968) described the function of individual words in connected discourse in the following manner: " Kangaroos cannot digest oysters. It may well be the case that this sentence has never been written or spoken before. Even if it has, the reader has almost certainly never encountered it - yet he understands it immediately. In this respect new sentences are strikingly unlike new words: if you meet the word kookaburra for the first time, you need to be told that it stands for an Australian bird with a characteristic cackling cry, and no amount of previous knowledge of the English language will enable you to anticipate that word's meaning. ... It would be wrong to think of words as independent blocks which have, somehow and mysteriously, to be put together again in possibly novel ways to produce unified structures. We start with the 'structures' (sentences) whose meanings are apprehended as wholes. As we begin to analyze these holophrases into elements that can be rearranged and recombined, we learn at the same time how to recognize them. Thus analysis and synthesis are inseparable aspects of the mastery of linguistic structure " (p.49-51).

A further difference between words in isolation and words in context lies in the reduction of ambiguity which context normally affords. For example, words in the sentence " Pale flames gently illuminate airy lanterns " afford such mutual clarifica-

tion, while the elements of " Light lights lightly light light lights " (Osgood, 1963) do not, though the meaning of the two expressions may be identical. Consequently, it is possible that isolated words, which very often have a multitude of meanings (Rubenstein, Lewis, and Rubenstein, 1971) have an applicability wider than that which they have when used in any particular context.

Miller (1965) wrote: " If the meaning of a sentence could in some sense be regarded as the weighed sum of the meanings of the words which comprise it, then once we knew how to characterize the meanings of individual words, it would be a simple matter to determine the meaning of any combination of words. Unfortunately, however, language is not so simple; a Venetian blind is not the same as a blind Venetian. ... In isolation most words can have many different meanings; which meaning they take in a particular sentence will depend on the context in which they occur. That is to say, their meaning will depend both on the other words and on their grammatical role in the sentence " (p.174).

The results of experiment two may be understood in terms of a model such as that proposed by Feather (1971): " It is assumed that abstract cognitive structures develop as the person copes with the influx of information from the external world,

that these abstract structures must be organized and relatively stable to provide continuity and meaning under changing circumstances, but that they are susceptible to change as the person matures, and as new and discrepant information is received that cannot readily be interpreted in terms of existing abstract structures " (p.356).

If 'cognitive structures' of this sort are assumed to be the property of the subject, and comprehension a process of integration of text into structured knowledge, the subject's contibution and its relevance to comprehension level become clearer. An analogous interpretation of the reading process was offered by Weber (1970), and by Levin and Kaplan (1970) who wrote: " The reader, or listener, continually assigns tennative interpretations to a text or message and checks these interpretations. As the material is grammatically or semantically constrained he is able to formulate correct hypotheses about what will come next. When the prediction is confirmed, the material covered by that prediction can be more easily processed and understood " (p.132).

An active and synthetic view of comprehension is further suggested by findings indicating that language acquisition is preceded by the capacity to assess meaning, that the 'abstract cognitive structures' may be present at the beginning of language usage. Macnamara (1972) stated that: " Infants learn their lan-

guage by first determining, independent of language, the meaning
which a speaker intends to convey to them, and by then working
out the relationship between the meaning and the language. ...
The infant uses meaning as a clue to language, rather than lan-
guage as a clue to meaning " (p.1).

The results of experiment two and the foregoing descriptions
of reading and language use suggest that the quantification of
the meaning value of individual words is not likely to lead to
an exhaustive description of text comprehension which readers
can gain as a result of exposure to meaningful connected dis-
course.

In discussing processes which are part of reading, the
introductory section of this investigation proposed a division
of reading into identification and comprehension. Identifica-
tion was described as the process involved in decoding of visual
text attributes, and comprehension was discussed in terms of
integration, interpretation, and retentive transformation of
text contents. It was pointed out that, as a consequence of auto-
matization and parallel processing of certain aspects of the sur-
face structure, the identification process can successfully handle
distorted and incomplete visual patterns. The results of experi-
ment two further show that, as a result of comprehension of the
material, skilled subjects could successfully infer the identity

of the "Actor" words which had no visual attributes at all.

"Pure" identification was described as the act of decoding
where all resort to text meaning or automatization was precluded,
as in the processing of individual letters or of words from a
foreign language. The outcome of experiment two suggests that
identification in such "pure" form may not be present in normal
comprehension-oriented reading, and that those aspects of the
text inaccessible through visual decoding can be filled-in by
other means, namely through recourse to text meaning.

It is possible that a trade-off relationship between re-
liance on visual text attributes and text meaning exists, and
that it may be impractical to attempt to specify which parti-
cular text attribute was established through which process. Such
a viewpoint was offered by Goodman (1967): " Reading is a se-
lective process. It involves partial use of available minimal
language cues selected from perceptual input on the basis of the
reader's expectation. As this partial information is processed,
tentative decisions are made to be confirmed, rejected, or re-
fined as reading progresses " (p.260).

The deleted text words in experiment two were of a specific,
and strategically relevant nature, consisting of the noun by which

the topic of the text was described or represented. Neisser (1967) proposed that memory itself is a synthetic process, and that long-term storage retrieval constitutes a reconstruction of previous synthetic activities. Neisser's viewpoint makes it possible to propose that since the filling-in of the "Actor" elements was a constructive act it may have been particularly elevated in retentive availability over words which were merely received from the text. Though such a possibility does not affect the present results, it may be interesting for future research to undertake a comparison of retention levels of deleted text elements of varying cognitive importance in order to determine whether the deletion or the cognitive relevance of such words plays a more important role in their retention.

A further aspect of the present experimental technique may be useful in future investigations. Quine (1960) and Mowrer (1954) have suggested that there is a relationship between personality disturbance and language use. Although the investigation techniques proposed by these authors are incompatible with the present interpretative paradigm, the suggestion may prove applicable. Ambiguous perceptual stimuli such as those in the Rorschach and the Thematic Appreception Test have been successfully used in differentiating among certain personality variables. It may consequently be pos-

sible to employ ambiguous linguistic contexts to elicit divergent one word responses of the kind generated by the materials on the "Actor" inference task in experiment two.

This technique would obviously resemble word association, but the use of longer contexts, and a manipulation of the level of ambiguity may allow for a restriction of responses to a relevant few, which would be easy to tabulate and categorize diagnostically. As was previously suggested isolated words, which are used in word association, may be too ambiguous, and may be processed by means other than the 'cognitive structures' involved in the interpretation and assesment of normal communication.

As a consequence of the outcome of the two reported experiments it appears that, on the whole, future research dealing with processes relating to normal reading and comprehension will be most productive where it employs connected meaningful discourse and accepts the possibility that data generated on the basis of isolated words and small random word combinations may not be directly relevant to its concerns.

The results of the present investigation suggested that individual words in a text may be processed and retained in ways different from the processing of text meaning and comprehension, and may consequently not be the appropriate units for their partitioning.

SUMMARY

The two experiments reported in the present investigation explored some aspects of the relationship between familiarity with the words of certain texts and the comprehension levels generated by skilled subjects as a result of exposure to those texts. The experiments also examined the relative applicability of some of the assumptions of two divergent theoretical interpretations of reading comprehension.

Experiment one directed one group of skilled readers to process text for comprehension, and a second group to try and retain as many of the actual text words as possible. Comprehension and the ability to recognize text words was measured in both groups and results show that the first group generated a significantly higher level of comprehension while recognizing significantly fewer text words than the second group. This outcome indicates a lack of direct relationship between the ability to recognize text words and comprehension of that text and suggests the cognitive and retentive processes underlying these two functions may be different.

Experiment two provided subjects with text where the main element, the noun describing the topic or "Actor" (Hunt, 1971) was deleted. This experiment measured comprehension levels generated on the basis of such text, the subjects' ability to recall

peripheral text words, and their success in infering the identity of the deleted main elements. Results show a significant positive relationship between success in infering the identity of the "Actor" and comprehension level, and a lack of statistical relationship between the ability to recognize peripheral text words and "Actor" inference.

Since the function of each text word (whether "Actor" or peripheral) is determined by context rather than its identity, the results of experiment two imply that efforts at the quantification of isolated words which do not take context into consideration cannot describe normal comprehension-oriented reading completely because they include no means of assessing the relevance of a particular word in a particular context.

The results also showed that subjects filled in the identity of the deleted "Actor" words at success levels far exceding chance. In conjunction with the other results this factor shows that the skilled reader can demonstrably contribute to text comprehension and that his comprehension level is not entirely determined by the contents of the stimulus text itself.

REFERENCES

Bar-Hillel, Y. A quasi-arithmetical notation for syntactic description. Language, 1953, 29, 47-58

Begg, I. Recognition memory for semantic meaning and wording. Journal of Verbal Learning and Verbal Behavior, 1971, 10, 176-181

Begg, I. & Paivio, A. Concreteness and imagery in sentence meaning. Journal of Verbal Learning and Verbal Behavior, 1969, 8, 821-827

Black, M. The labyrinth of language. London, Pall Mall Press, 1968

Bransford, J. & Franks, J. The abstraction of linguistic ideas. Cognitive Psychology, 1971, 2, 331-350

Brown, R. Psychology and reading. In Levin, H. & Williams, J. P. (Ed.) Basic studies on reading. New York, Basic Books Inc. 1970

Bugelski, B. The psychology of learning applied to teaching. Indianopolis, Bobbs-Merrill, 1971

Cherry, C. On human communication. Cambridge, M.I.T. Press, 1964

Chomsky, N. Aspects of the theory of syntax. Cambridge, M.I.T. Press, 1966

Cliff, N. Adverbs as multipliers. Psychological Review, 1959, 66, 27-44

Feather, N. T. Organization and discrepancy in cognitive structures. Psychological Review, 1971, 78, 355-379

Gerbner, G., Holsti, O. R., Krippendorff, K., Paisley, W. J., & Stone, P. J. The analysis of communication content. Toronto, Wiley and Sons, 1969

Gibson, E. J. Principles in perceptual learning and development. New York, Appleton-Century-Crofts, 1969

Gibson, E. J. Perceptual learning and the theory of word perception. Cognitive Psychology, 1971, 2, 351-368

Goodman, K. S. Reading: A psycholinguistic guessing game. Journal of Reading Specialists, 1967, 6, 126-135

Greene, H. A. & Kelley, V. H. Iowa silent reading test. New York, Harcourt, Brace, and World Inc. 1943

Hunt, E. What kind of computer is man? Cognitive Psychology, 1971, 2, 57-98

Klopfer, B. & Davidson, H. H. The Rorschach method of personality diagnosis. New York, World Book Co. 1942

Kolers, P. A. Three stages of reading. In Levin, H. and Williams, J. P. (Ed.) Basic studies on reading. New York, Basic Books Inc., 1970

Langer, S. K. Philosophy in a new key. New York, Mentor Books, 1951

Levin, H. & Kaplan, E. L. Grammatical structure and reading. In Levin, H. & Williams, J. P. (Ed.) Basic studies on reading. New York, Basic Books Inc. 1970

Lindzey, G., Bradford, J., Tejessy, C. & Davis, A. Thematic Appreception Test. Journal of Clinical Psychology, Monograph supplement, 12, 4, 1959

Macnamara, J. Cognitive basis of language learning in infants. Psychological Review, 1972, 79, 1-23

Miller, G. A. Some preliminaries to psycholinguistics. American Psychologist, 1965, 20, 15-20

Mowrer, O. H. The psychologist looks at language. American Psychologist, 1954, 9, 660-694

Nash, J. Developmental psychology. Englewood Cliffs, New Jersey, Prentice-Hall, 1970

Neisser, U. Cognitive psychology. New York, Appleton-Century
    -Crofts, 1967

Noble, C. An analysis of meaning. Psychological Review, 1952,
    59, 421-430

Osgood, C. E. Behavior theory and the social sciences. Behavioral
    Science, 1956, 1, 51-72

Osgood, C. E. On understanding and creating sentences. American
    Psychologist, 1963, 18, 735-751

Osgood, C. E. Semantic differential technique in the study of
    cultures. American Anthropologist, 1964, 66, 171-200

Osgood, C. E. Toward a wedding of insufficiencies. In Dixon, T.
    & Horton, D. (Ed.) Verbal behavior and general behavior theory.
    Englewood Cliffs, New Jersey, Prentice-Hall Inc. 1968

Osgood, C. E. On measurment of meaning. In Snider, J. & Osgood, C. E.
    (Ed.) Semantic differential technique. Chicago, Aldine Co. 1969

Osgood, C. E. Suci, G. & Tannenbaum, P. The measurment of meaning.
    Urbana, Illinois, University of Illinois Press, 1957

Paivio, A. & Okovita, H. W. Word imagery modalities and associative
    learning in blind and sighted subjects. Journal of Verbal
    Learning and Verbal Behavior, 1971, 10, 506-510

Polanyi, M. Sense-giving and sense-reading. Philosophy, 1967, 42,
    301-325

Quine, W. V. O. Word and object. Cabridge, M. I. T. Press, 1960

Reicher, G. M. Perceptual recognition as a function of meaning-
    fulness of stimulus material. Journal of Experimental Psychology,
    1969, 81, 275-280

Rubenstein, H., Lewis, S., & Rubenstein, M. Homographic entries
    in the internal lexicon. Journal of Verbal Learning and Verbal
    Behavior, 1971, 10, 57-62

Schrammell, H. E., & Gray, W. H. Emporia silent reading test. Emporia, Kansas, Buerau of Educational Measurments, 1934

Singer, H. Theoretical models of reading. Journal of Communication, 1969, 19, 134-156

Smith, F. Understanding reading. New York, Holt, Rinehart, and Winston, 1971

Snider, J. & Osgood, C. E. Semantic differential technique. Chicago, Illinois, Aldine Co. 1969

Stein, G. & Solomons, L. M. Motor automatisms. New York, Phoenix Books, 1969 (Originally published: Psychological Review, May 1886, and Septempber, 1889)

Terwilliger, R. F. Meaning and mind. Toronto, Oxford University Press, 1968

Thorndike, E. L. Reading as reasoning: A study of mistakes in paragraph reading. Journal of Educational Psychology, 1917, 8, 323-332

Weber, R. First graders' use of grammatical context in reading. In Levin, H. & Williams, J. P. (Ed.) Basic studies on reading. New York, Basic Books Inc. 1970

Wheeler, D. D. Processes in word recognition. Cognitive Psychology, 1970, 1, 59-85

Wiener, H. & Cromer, W. Reading and reading difficulty: A conceptual analysis. Harvard Educational Review, 1967, 37, 620-643

Wilson, A. R., Robeck, M. C., & Michael, W. R. Psychological foundations of learning and teaching. New York, McGraw-Hill, 1969

Woodworth, R. S. Experimental psychology. New York, Holt, Rinehart, and Winston, 1938

APPENDIX A

PILOT STUDIES CONDUCTED IN PREPARATION FOR EXPERIMENT ONE

Pilot Study One

In an effort to explore the general area of experiment one a group of eight subjects was presented with a standard text, instructed to read it, and to answer several accompanying comprehension questions. A group of seven other subjects was given the same text, containing, however, a number of deliberately introduced spelling errors which it was their task to find. This second group of subjects was then also asked to answer the comprehension testing questions. It was found upon evaluation of results that subjects in the second group demonstrated a slightly higher mean comprehension score. They had also, however, taken significantly longer to process the material.

It is possible that since these subjects were processing a relatively lengthy text they may have slipped back into their habitual manner of reading and subsequently found it necessary to return in search of mis-spellings. In order that such a possibility may be eliminated it was decided that instead of one long text, experiment one use a series of short independent paragraphs so that instructions may be repeated. The results of the first pilot study also suggested a need for reading-time control in order to discourage re-processing of the material. The use of a concrete reinforcement, namely financial reward, suggested itself as a means of ensuring that subjects process the text as quickly as possible, and that they pay attention to the instructions.

Pilot Study Two

In this study twelve subjects were presented with a series of paragraphs, each immediately followed by comprehension, word recognition, and "fragment" recognition questions. The "fragments" consisted of adjacent word segments such as"-pret ins-" or "-sts its-" of the same average length as the words in the word recognition task. Each subject was assigned into one of the three experimental groups and accordingly rewarded one cent per correct answer to one of the three types of questions. In spite of the reward no inter-group differences were detected. All subjects took more time to answer the fragment recognition questions than questions of the other types, again regardless of reward. A close inquiry into the habits of the various subjects suggested that the fragment recognition questions are superfluous since subjects consciously attempt to reconstruct words from the fragments. Due to these results it was decided that the reward used in experiment one be increased, and that only the comprehension and word recognition questions be used.

METHODOLOGICAL COMMENTS

An alternative method of testing the hypotheses of experiment one would have called for each subject to act as his own control by requiring him to change response style in the middle of the experiment from an orientation toward comprehension toward word recognition, and vice versa.Such a method was not useful under the present circumstances because subjects in this experiment were led to develop a suitable reading style through practice on many fully paid examples, and even so a large number found it hard to adjust to the requirements of the task and to

change from customary reading habits. Had the subjects been required to deduce the necessity of a change in reading style in the middle of the experiment the total duration and expense of the procedure would have been prohibitive.

The order of answering questions was flexible in experiment one in that subjects having problems in dealing with a particular question were allowed to procede with the rest and return to the omitted question after the completion of the rest of the page. This flexible order was adopted for the following reasons: first of all, the function of the questions was to recover the largest possible amount of information from the subject. A rigid order would have lead to procrastination on questions where the subject was uncertain of the answer and delayed the processing of questions where answers were readily available. Pilot study two indicated that the average length of time needed for the processing of questions of the type "A,B,C" and the type "X,Y,Z", the comprehension and word recognition questions, ranges from 15 to 25 seconds. The extent of delay to the postponed questions is therefore not likely to be very significant, and, in any case, a delay to a question of whose answer the subject is uncertain is less counterproductive than the alternate choice of delay to questions where answers are available at the conclusion of the processing of the article.

Secondly, the experimentor was seated directly opposite the subject, observed all his actions, administered the reward and evaluated all answers. The atmosphere which was thus created was altogether inconducive to misuse of the situation in ways which were perceived as contrary to the rules and expectations of the experiment. The inclusion of the control task which specifically measured performance on the non-

rewarded questions also made it clear to the subject that all of the questions were important. The subjects in experiment one did not give an impression of taking undue advantage of the flexibility afforded them in the order of answering questions, and appeared to postpone particular questions and diverge from the normal top to bottom order only when those questions were particularly puzzling. On the whole I believe this method afforded a better means of assesing the subjects knowledge than a rigid order could have.

MATERIALS EMPLOYED IN EXPERIMENT ONE

INSTRUCTIONS

In this test you will be presented with a series of short paragraphs. Each paragraph will be immediately followed by three types of questions. Type one questions are marked A,B,C, type two are marked PROBLEMS, and type three are marked X,Y,Z.

You will earn your reward on the following basis:

1) two cents for each correct answer to A,B, and C questions
2) one cent for every two seconds by which your paragraph reading time falls short of 25 seconds
3) minus five cents for every omitted answer

In order to earn the maximum amount make sure that you answer all questions, read the paragraph as fast as you can, and while you are reading it be aware of what you are looking for.

You will be given examples of the procedure. If any questions remain, please ask the experimentor for clarification.

INSTRUCTIONS

In this test you will be presented with a series of short paragraphs. Each paragraph will be immediately followed by three types of questions. Type one questions are marked A,B,C, type two are marked PROBLEMS, and type three are marked X,Y,Z.

You will earn your reward on the following basis:
1) two cents for each correct answer to X,Y, and Z questions
2) one cent for every two seconds by which your paragraph reading time falls short of 25 seconds
3) minus five cents for every omitted answer.

In order to earn the maximum amount make sure that you answer all questions, read the paragraph as fast as you can, and while you are reading it be aware of what you are looking for.

You will be given examples of the procedure. If any questions remain, please ask the experimentor for clarification.

EXAMPLE 1

1. A pencil makes a mark when the surface on which it is scratched is rough and hard enough to wear off a part of the lead. A pencil will not write on a pane of glass, because it is so smooth that the pencil will glide over the surface. It will not write on anything very soft, beca se it will not wear off enough of the lead to make a mark. When in use, a pencil keeps getting shorter and shorter, because a part of the lead is being left on the paper.

EXAMPLE 1

A. Choose the best title for the paragraph.
1 How a Pencil Is Made   2 How a Pencil
Writes   3 Writing on a Hard Surface .... A

B. Why is it difficult to write on a pane of glass with
a lead pencil?   1 Glass is too smooth.   2 Pencil
is too hard.   3 Lead is too soft. .... B

C. The lead in a pencil wears down faster when writ-
ing on a —   1 pane of glass   2 sheet of smooth
white paper   3 piece of wrapping paper .. C

27 - 19 =

Which of these words occured in the paragraph?

X.   1. When   2. Plain   3. Carbon

Y.   1. Hard   2. Short   3. Smoother

Z.   1. Softer   2. Right   3. Part

EXAMPLE 2

Professor Louis Agassiz was a great scientist who taught natural history at Harvard University. His skill in classifying birds, fish, or insects was remarkable. If he were given a single bone of a bird, he could tell instantly the kind of bird to which it belonged. He could do the same with other animals.

EXAMPLE 2

A. Choose the best title for the paragraph.
    1 A Great Scientist   2 Harvard University
    3 Classification of Animals . . . . .A

B. At what educational institution did Agassiz do his
    great work as a scientist?   1 Columbia
    2 Johns Hopkins   3 Harvard. . . . . .B

C. Louis Agassiz attained wide renown as a result of his
    remarkable skill in —   1 classifying animals
    2 teaching natural history   3 writing. C

99 x 3 =

Which of these words occured in the paragraph:

X. 1. Assagniz   2. Characteristic   3. Skill

Y. 1. Instantly   2. Reptiles   3. Invertebrates

Z. 1. Member   2. Great   3. Into

1. In some parts of the world metal pins have been in use for ages. In certain Egyptian tombs pins of bronze and copper have been found. Pins like our hatpins, and others like the safety pins of today, were used by people in very ancient times. The first pins made in our country were nothing but bits of wire. The wire was rolled up at one end to form a head, while the other end was sharpened.

1

A. Choose the best title for the paragraph:

1. Bronze and Copper Pins
2. Early Metal Pins
3. The Use of Hatpins

B. Over how long a period have pins been made and used?

1. Since modern times
2. Since very ancient times
3. Since the founding of this country

C. The pins found in Egyptian tombs were made of:

1. Bronze and copper
2. Copper wire
3. Iron wire

30 + 20 =

Which of these words occured in the paragraph?

X. 1. Sharpen
   2. Sharpened
   3. Pulled

Y. 1. Continent
   2. Country
   3. Here

Z. 1. Evolved
   2. Different
   3. Others

2

The first discovery that our ancestors made about coal was that it would burn. The second great discovery, which was made many years later, was that coal would become coke if it were heated out of contact with the air, so as not to burn it. The third very recent discovery was the recovery of the by-products from the gases evolved when the coal was heated in this way.

2

A. Choose the best title for the paragraph.
  1 Discovery of Coal   2 Discoveries about Coal
  3 By-products of Coal........................A

B. What is the most recent of the important discoveries
  concerning the uses of coal?   1 recovery of by-
  products from coal gas   2 recovery of coal gas
  3 its heat-producing qualities...................B

C. In order to produce coke, coal must be heated —
  1 under air pressure   2 away from air
  3 under water...............................C

$$173 - 24 =$$

Which of these words occured in the paragraph:

X 1) gas   2) gases   3) heat

Y 1) later   2) pressure   3) extract

Z 1) will   2) ways   3) would

3

The art of clay-working was first evolved through the manufacture of pottery. The development of satisfactory bodies and color effects came through trial and error and accordingly involved great expenditure of labor. As the clay industry grew, these processes were held in secrecy and improvements were slow in coming. With the advancement of science in other industries, however, it was natural that its attention should also be directed toward clay-working.

3

A. Choose the best title for the paragraph.
   1 Growth of Industries   2 Manufacture of Vases
   3 Art of Clay-Working.........................*..A

B. Why did clay-working as an art develop slowly?
   Because of —   1 secrecy concerning the processes
   2 introduction of scientific methods
   3 labor trouble............................B

C. Early improvements in pottery body and color effects
   came about largely as a result of —   1 research
   2 an accidental discovery   3 trial and error....c

198 : 2 =

Which of these words occured in the paragraph:

X. 1. Poetry   2. Advancement   3. Although

Y. 1. Commerce 2. Bodies   3. Increase

Z. 1. Horse   2. Without   3. Attention

4

The extreme northern end of South America
is farther from the extreme southern end than
Panama is from Greenland. At the southern tip
is a high rocky cape; at the northern tip the
mountains reach the sea; and between them is
the great Andean mountain system which is a
world by itself. This mountain world is high
and cool, even where the hot tropic lowlands lie
at its feet. Some of the world's highest volca-
noes are Andean peaks, the smoking tops of
which are covered with perpetual snow. Dust
blown out from these volcanoes has made much
rich valley land between the ranges.

4

A) The cape mentioned in the para-
graph is in:
1. Panama. 2. Greenland. 3. South
America. 4. Alaska.

B) The climate of the Andean moun-
tain world is:
1. tropical. 2. warm. 3. rainy.
4. cool.

C) As a result of volcanic action, there
have been benefits to:
1. agriculture. 2. mining. 3. lum-
bering. 4. mountain-climbing.

$$29 + 12 =$$

Which of these words occured in the paragraph:

X 1) wide 2) rich 3) shore 4) mud

Y 1) much 2) little 3) heavy 4) light

Z 1) cold 2) hills 3) hot 4) touch

5

The red in the cross stands for sacrifice, for giving life, as the warm crimson blood gives life to the body. The cross has the same length on all four of its arms, to signify that it gives life equally to all, high or low, east or west. It stands alone always, no words or markings on it, to show that the Red Cross workers have only one thought — to serve. They ask no questions, they care not whether the wounded be ours or those of another race. Their duty is to give and to give quickly.

5

A. Choose the best title for the paragraph —
  1 Red Cross Workers   2 Description of the
  Red Cross   3 Meaning of the Red Cross......A

B. What one word expresses the characteristic for which
  the Red Cross is known?   1 sacrifice
  2 service   3 safety........................B

C. The four arms of the Red Cross symbol are equal, to
  indicate —   1 world-wide service   2 equality of
  all who need help   3 universal charity........C

$$222 \div 3 =$$

Which of these words can be found in the preceding paragraph:

X   1) charity   2) giving   3) real

Y   1) duty   2) obligation   3) soul

Z   1) up   2) down   3) show

6

The biggest surprise and the biggest thrill I ever got anywhere came on a forbidden trek through the Siamese jungles near the Burma border line. That's where the hamadryads mate and breed, fight and kill. The fiercest, fightingest, fastest snake alive; the only snake which can outrun a horse; the only snake that will attack a man on sight—that's the ring cobra, more properly known as the hamadryad. You don't hunt the hamadryad; he hunts you. He's sixteen feet of coiled and poisoned fury. His hood, when puffed out like the black cobra, is almost as wide as this page. He's king of the serpents, roving terror of the Siamese jungle lands.

6

A) The hamadryad lives in: |
1. the African jungles. | 2. desert
lands. 3. North America. 4. the Si-
amese jungles.
B) The ring cobra is:
1. afraid of man. 2. very swift.
3. a comparatively small snake.
4. large and sluggish.
C) As compared to the height of man,
the length of the hamadryad is
about:
1. the same. 2. twice as great.
3. one-half as great. 4. three times
as great.

---

12 x 12 =

Choose the word which was in the paragraph:

X 1) monarch 2) wide 3) dog 4) hurt

Y 1) teeth 2) hamadrayd 3) worst 4) alive

Z i) annoy 2) man 3) reptile 4) blown

7

The starfish has a very thick central portion, the underside of which is called the mouth. From the central portion five pointed arms extend, which give it the general appearance of a star. The spiny skin contains a deposit of lime which makes it hard and somewhat shell-like if the fish is removed from the water for a long time. When in the water, the starfish moves about quite freely. By means of a double row of sucker feet the starfish is able to move about and to fasten itself firmly to objects.

. 7

A. Choose the best title for the paragraph.   1 What
the Starfish Looks Like   2 The Arms of the
Starfish 3 The Sucker-like Feet of the Starfish A

B. How does the starfish fasten itself to an object?
1 by its five-pointed arms   2 by its sucker-like
feet   3 by its mouth...................... B

C. In the water, the starfish —   1 swims about easily
2 fastens itself to a rock   3 cannot swim
because of its spiny skin.................... C

$(7 + 14) \div 7 =$

Choose the word which was in the paragraph:

X   1) bottom   2) feeler   3) feet

Y   1) shell-like   2) look   3) back-bone

Z   1) lemon   2) shrimp   3) mouth

8. If you will look carefully at the creeping ivy vine, you will find that it sends out many little fine shoots or tendrils which attach themselves to rough places in the wall. If there were only one or even just a few of these tendrils, they could not support the vine. However, there are a great many of them and each holds a little; so they are able to support heavy vines.

8

A. Choose the best title for the paragraph.
1 How Ivy Shoots Grow   2 The Way Ivy
Climbs Walls   3 The Tendrils on Ivy Vines A

B. What makes it possible for an ivy vine to climb
up a brick wall?   1 tendrils   2 suction cups
on the leaves   3 a sticky substance...... B

C. The heavy vine clings to the wall because —
1 one of the shoots holds it
2 many of the shoots hold it   3 the leaves
attach themselves to the wall.............. C

$$201 + 93 =$$

Choose the word which was in the paragraph:

X 1) observe   2) watch   3) could

Y 1) small   2) only   3) big

Z 1) hold   2) support   3) wire

9. The swordfish has been so named because of the long, sword-like snout with which it defends itself and secures its food. In shape its body is much like that of a mackerel. It reaches a length of four to fifteen feet, and weighs from one hundred fifty to six hundred pounds. The sword, which is sometimes three feet long, is formed by the prolonged and toughened bone of the upper jaw. It is usually somewhat flattened and has a very sharp point.

9

A. Choose the best title for the paragraph.   1 How
the Swordfish Fights   2 The Weight of the
Swordfish 3 How the Swordfish Gets Its Name A

B. How long does the bony snout of the swordfish
sometimes grow?   1 six feet   2 three feet
3 fifteen feet...................... .... B

C. A full-grown swordfish usually weighs —   1 three
to fifteen pounds   2 fifty to one hundred pounds
3 one hundred fifty to six hundred pounds .. c

---

71 - 43 =

Which of these words occurs in the paragraph:

X   1) mackerel   2) fish   3) tuna

Y   1) fore   2) four   3) five

Z   1) sores   2) sources   3) secures

10. The coconut-palm tree is put to many uses. The natives make paper, twine, ropes, and brushes from the fiber. The shell is used for ladles and cups. The young leaves are eaten like cabbage. Baskets, fans, and fish nets are made from the mature leaves. The trunk is used for canoes and posts.

10

A. Choose the best title for the paragraph.
   1 Uses of the Coconut Palm   2 Native Canoes
   3 Palm-Leaf Baskets.........................A

B. The natives use the leaves of the coconut palm to
   make —   1 cups   2 canoes   3 baskets.....B

C. The trunks of the palm trees are used to make —
   1 fish nets   2 native canoes   3 fans........C

199 + 31 =

Which of these words occured in the paragraph:

X   1) walls   2) cups   3) shal

Y   1) made   2) post   3) make

Z   1) digestable   2) noose   3) ladles

11. Cotton culture is not unlike that of corn and potatoes. Fields are plowed and fertilized and the seed is dropped in hills. Cotton planting begins in February and frequently continues for two months. During May and June, when corn is just being planted, the cotton plants are ready to be cultivated. This is done with a hoe and is called "chopping cotton." At this time the rows are thinned by cutting out the poorer plants. During the latter part of September cotton picking begins.

11

A. Choose the best title for the paragraph.
   1 Planting Cotton   2 Picking Cotton
   3 Producing Cotton............................**A**

B. During what month is cotton planting usually begun in
   the South?   1 September   2 February
   3 May.......................................**B**

C. Growing corn in the corn belt is much like growing
   cotton in the South because — 1 the seed is planted
   in hills in plowed fields   2 planting of both is done
   at the same period   3 both are cultivated by hand c

---

198 - 93 =

Which of these words occured in the paragraph

X. 1. Harvest   2. Dropped   3. Yield   4. Crop

Y. 1. Just   2. Being   3. Grown   4. South

Z. 1. Continues 2. Wheat   3. Carrots   4. Before

12. The Boy Scout movement has spread from its first organization in 1907 until fifty-seven countries, representing over 90 per cent of the population of the world, have adopted the Scout program. Scout troops dot every corner of our own country. More than 800,000 Scouts from Maine to California are doing their daily good turns.

12

A. Choose the best title for the paragraph.   1 Spread of the Boy Scout Movement   2 Importance of Scouting   3 First Organization of Boy Scouts ᴬ

B. In how many countries are Boy Scout troops organized?   1 the United States only
     2 90 countries   3 57 countries .... ᴮ

C. The number of Scouts in the United States is more than — 1 300,000   2 800,000   3 1,600,000 c

19 - 40 =

Which of these words occured in the paragraph:

X. 1. Proportion   2. Joined   3. Corner

Y. 1. Per cent   2. Knowlege   3. Consisting

Z. 1. Roots   2. Vermont   3. Fifty-seven

13. Flax grows in the cold-temperature belts. Flax can stand cold and drought pretty well; but a fair amount of rain is necessary in order to have a good quality of flax. Growing flax and getting the fiber from it when it is grown are both hard, slow tasks. Fields of flax have to be weeded carefully by hand. The stalks also have to be softened under water by letting them decay before the fibers can be pulled off the woody core of the stalk.

13

A. Choose the best title for the paragraph.
1 The Nature of Flax   2 Temperature Needed
for Flax   3 Conditions for Growing Flax   A

B. Why is the production of flax slow and
expensive?   1 It must be protected from
cold.   2 It must be cultivated by hand.
3 It must have plenty of water............. B

C. The fibers of flax can be separated only — 1 during
the rainy season   2 when the stalks have been
soaked in water   3 after they have been frosted c

298 + 3 =

Which of these words occured in the paragraph:

X. 1 . Fair   2. Gold   3. Moisture 4. Ropes

Y. 1. Stems   2. Both   3. Agriculture   4. Enzymes

Z. 1. Order   2. Pruned 3. Expensive   4. Decompose

14. Hot springs often bring large amounts of fine rock waste to the surface with the steaming water. This waste is then deposited around the opening of the spring, where in time it forms a hard mound several feet high with a crater in the center. Although seldom over sixty feet in height, the resemblance of these mounds to true volcanoes has given them the name of "mud volcanoes."

14

A. Choose the best title for the paragraph.
    1 How Hot Springs Are Formed   2 How Mud
    Volcanoes Are Made   3 Height of Volcanoes A

B. What forms the crater-like openings around hot
springs?   1 rock deposits   2 soft mud
    3 petrified wood . . . . B

C. Few mud volcanoes exceed a height of —
    1 sixty feet   2 six inches   3 six feet . . C

1989 - 1899 =

Which of these words occured in the paragraph:

X. 1. Tall   2. Even   3. Time   4. Stream

Y. 1. Measured   2. Lava   3. Surface   4. Like

Z. 1. Forms   2. Create   3. Earth   4. Knoll

16. Before 1S80 only a few thousand immigrants came to this country from Italy. After the above year they began to come in large numbers. The number varied from year to year, but often it ran into the hundreds of thousands. Most of the Italian immigrants came from southern Italy, where the population is very dense and where living conditions are very poor. Today there are more Italians in New York City than in Naples. The Italian immigrants do not all remain in New York but may be found in almost every American city.

15

A. Choose the best title for the paragraph.   1 Italian
Immigration to America   2 How Italians Come to
This Country   3 Why Italians Come to New York   A

B. Which of these cities has the largest Italian popu-
lation?   1 Naples   2 San Francisco   3 New York   B

C. Italian immigration to this country was heaviest
from —   1 southern Italy   2 northern Italy
3 central Italy c

$$(11 \times 11) + 9 =$$

Which of these words occured in the paragraph:

X. 1. Century   2. Come   3. Profound   4. Mixture

Y. 1. Sicily   2. Posessions   3. Today   4. Palermo

Z. 1. Above   2. Million   3. Courage   4. Stream

Please turn over your answer sheet and describe in your own words:

1) How (and if) your reading style in this experiment differed from the way you usually read

2) What do you think this experiment was attempting to measure?

3) Other Comments

4) How would you estimate your performance on the non-rewarded questions?

APPENDIX B

PILOT STUDY CONDUCTED IN PREPARATION FOR EXPERIMENT TWO

A group of ten undergraduate subjects participated in the pilot study in which all materials with the exception of "Actor" inference questions were identical to those eventually employed in experiment two. The "Actor" questions differed in the number and kind of alternatives which were used. A seventh alternative read, in all cases, "none of the above" and thus effectively increased the number of choices from six to infinity. The ten subjects chose alternative number seven in up to 30 % of their answers. Alternative seven did not constitute the correct answer in any of the cases, and since it seriously limited the range of correct answers it was not used in the actual experiment. An inquiry into the choice of distractor items showed that errors in favour of distractor items other than number seven occured only where these items related topically to the correct choice. Distractor items which were picked at random were never chosen as correct answers by subjects in this study. Since a large number of perfect scores was also undesirable, experiment two used "Actor" inference questions where distractor items were topically related to the correct choice.

METHODOLOGICAL COMMENTS

The reason why experiment two relied on data resulting from a spontaneous gradation rather than a division of the subject pool into two groups or presentation of two different kinds of materials is that

differences in performance in the inference of "Actor" cannot readily be achieved through a manipulation of instructions, and a presentation of varying experimental materials would have decreased the usefulness of results by making the two groups of subjects incomparable on a number of variables due to inevitable differences in the quality as well as quantity of texts where "Actor" either was or was not presented.

Subjects in the pilot study indicated that their idea of the identity of "X" at times changed upon exposure to the alternatives from which it had to be chosen because one of these alternatives may have suited the retained information better than their original guess. In some instances the subjects may thus have gained a new perspective on the article through exposure to the forced choice alternatives. To prevent possible contamination of other questions by this change the order of answering questions in this experiment was held rigid and the "Actor" inference questions were answered last.

MATERIALS EMPLOYED IN EXPERIMENT TWO

INSTRUCTIONS

This experiment is designed to evaluate the information content of various texts. It is not an IQ or reading skills test, so relax, and enjoy it.

Your task will be to read several short paragraphs in which some words were replaced by X,Y,Z etc.

There will be 8 questions asked of you after each paragraph, please answer all to the best of your ability, **in the order in which they are given.** You can take as long as you wish to answer these questions but please remember to read the paragraph as fast as possible, and only once.

Thank you for your participation.

EXAMPLE

1. A   X   makes a mark when the surface on which it is scratched is rough and hard enough to wear off a part of the lead. A   X   will not write on a pane of glass, because it is so smooth that the
X   will glide over the surface. It will not write on anything very soft, because it will not wear off enough of the lead to make a mark. When in use, a   X   keeps getting shorter and shorter, because a part of the lead is being left on the paper.

EXAMPLE

A. Choose the best title for the paragraph.
   1 How a   X   Is Made   2 How a   X
   Writes   3 Writing on a Hard Surface .... A

B. Why is it difficult to write on a pane of glass with
   a lead   X   ?   1 Glass is too smooth.   2   X
   is too hard.   3 Lead is too soft. .... B

C. The lead in a   X   wears down faster when writ-
   ing on a —   1 pane of glass   2 sheet of smooth
   white paper   3 piece of wrapping paper .. C

27 - 19 =

Which of these words occured in the paragraph?

D   1. When   2. Plain   3. Carbon

E   1. Hard   2. Short   3. Smoother

F   1. Softer   2. Right   3. Part

Which on of the following words did X , Y , or Z stand for in the preceding

paragrap ?   (in other words: which one of these things was the paragraph all about?)

1. wire

2. pencil

3. lipstick

4. needle

5. ball

6. quill

1. In some parts of the world metal X have been in use for ages. In certain Egyptian tombs X of bronze and copper have been found. X like our YX and others like the ZX of today, were used by people in very ancient times. The first X made in our country were nothing but bits of wire. The wire was rolled up at one end to form a head, while the other end was sharpened.

1

A. Choose the best title for the paragraph:

    1. Bronze and Copper X
    2. Early Metal X
    3. The Use of X

B. Over how long a period have X been made and used?

    1. Since modern times
    2. Since very ancient times
    3. Since the founding of this country

C. The X found in Egyptian tombs were made of:

    1. Bronze and copper
    2. Copper wire
    3. Iron wire

$$30 + 20 =$$

Which of these words occured in the paragraph?

D   1. Sharpen
      2. Sharpened
      3. Pulled

E   1. Continent
      2. Country
      3. Here

F   1. Evolved
      2. Different
      3. Others

Which on of the following words did X , Y , or Z stand for in the preceding

paragrao ?

1. sword

2. lamp

3. telephone

4. pendulum

5. pin

6. pot

2

The first discovery that our ancestors made about X was that it would burn. The second great discovery, wnich was made many years later, was that X would become Y if it were heated out of contact with the air, so as not to burn it. The third very recent discovery was the recovery of the by-products from the gases evolved when the X was heated in this way.

2

A. Choose the best title for the paragraph.
1 Discovery of X   2 Discoveries about X
3 By-products of X ....**A**

B. What is the most recent of the important discoveries
concerning the uses of X ?   1 recovery of by-
products from X gas   2 recovery of X gas
3 its heat-producing qualities...................**B**

C. In order to produce Y , X must be heated —
1 undér air pressure   2 away from air
3 under water.............................**C**

173 - 24 =

Which of these words occured in the paragraph:

D 1) gas   2) gases   3) heat

E 1) later   2) pressure   3) extract

F 1) will   2) ways   3) would

Which on of the following words did X , Y , or Z stand for in the preceding paragrao ?

1. coal

2. oxygen

3. sun

4. steam

5. leather

6. coffee

3

The art of X   Y   was first evolved through the manufacture of   Z ,   The development of satisfactory bodies and color effects came through trial and error and accordingly involved great expenditure of labor. As the X industry grew, these processes were held in secrecy and improvements were slow in coming. With the advancement of science in other industries, however, it was natural that its attention should also be directed toward X Y .

3

A. Choose the best title for the paragraph.
1 Growth of Industries   2 Manufacture of Z
3 Art of   X Y   ..../..A

B. Why did   X Y   as an art develop slowly?
Because of —   1 secrecy concerning the processes
2 introduction of scientific methods
3 labor trouble............................B

C. Early improvements in   Z   body and color effects
came about largely as a result of —   1 research
2 an accidental discovery   3 trial and error....C

$$198 + 2 =$$

Which of these words occured in the paragraph:

Ɔ   1. Poetry   2. Advancement   3. Although

E   1. Commerce .2. Bodies   3. Increase

F   1. Horse   2. Without   3. Attention

Which on of the following words did X , Y , or Z stand for in the preceding

paragrap ?

1. telephone

2. crossbow

3. headstone

4. pottery

5. swimming

6. agriculture

4

The extreme northern end of X Y
is farther from the extreme southern end than
Panama is from Greenland. At the southern tip
is a high rocky cape; at the northern tip the
mountains reach the sea; and between them is
the great Z mountain system which is a
world by itself. This mountain world is high
and cool, even where the hot tropic lowlands lie
at its feet. Some of the world's highest volca-
noes are Z peaks, the smoking tops of
which are covered with perpetual snow. Dust
blown out from these volcanoes has made much
rich valley land between the ranges.

4

A) The cape mentioned in the para-
graph is in:
1. Panama.   2. Greenland.   3.   X Y
4. Alaska.

B) The climate of the   Z   moun-
tain world is:
1. tropical.   2. warm.   3. rainy.
4. cool.

C) As a result of volcanic action, there
have been benefits to:
1. agriculture.   2. mining.   3. lum-
bering.   4. mountain-climbing.

29 + 12 =

Which of these words occured in the paragraph:

D 1) wide   2) rich   3) shore   4) mud

E 1) much   2) little   3) heavy   4) light

F 1) cold   2) hills   3) hot   4) touch

Which one of the following words did X , Y , or Z stand for in the preceding paragraph ?

      1. Pakistan

      2. mountains

      3. South America

      4. Alps

      5. England

      6. Sahara

5

The X in the Y stands for sacrifice, for giving life, as the warm crimson blood gives life to the body. The Y has the same length on all four of its arms, to signify that it gives life equally to all, high or low, east or west. It stands alone always, no words or markings on it, to show that the XY workers have only one thought — to serve. They ask no questions, they care not whether the wounded be ours or those of another race. Their duty is to give and to give quickly.

5

A. Choose the best title for the paragraph —
1 XY Workers 2 Description of the
XY 3 Meaning of the XY ......A

B. What one word expresses the characteristic for which
the XY is known? 1 sacrifice
2 service 3 safety..........................B

C. The four arms of the XY symbol are equal, to
indicate — 1 world-wide service 2 equality of
all who need help 3 universal charity........C

222 ÷ 3 =

Which of these words can be found in the preceding paragraph:

D 1) charity 2) giving 3) real

E 1) duty 2) obligation 3) soul

F 1) up 2) down 3) show

Which on of the following words did X , Y , or Z stand for in the preceding

paragrap ?

1. League of Nations

2. United Nations

3. Bell Telephone

4. Coca Cola

5. Red Cross

6. Canadian Pacific

6

The biggest surprise and the biggest thrill I ever got anywhere came on a forbidden trek through the Siamese jungles near the Burma border line. That's where the   X   mate and breed, fight and kill. The fiercest, fightingest, fastest   Y   alive; the only Y   which can outrun a horse; the only   Y   that will attack a man on sight—that's the   ZA   , more properly known as the   X   You don't hunt the   X   ; he hunts you. He's sixteen feet of coiled and poisoned fury. His hood, when puffed out like the   ZB   is almost as wide as this page. He's king of the   Y   , roving terror of the Siamese jungle lands.

6

A) The   X   lives in:
1. the African jungles.   2. desert lands.   3. North America.   4. the Siamese jungles.

B) The   ZA   is:
1. afraid of man.   2. very swift.
3. a comparatively small   Y
4. large and sluggish.

C) As compared to the height of man, the length of the   X   is about:
1. the same.   2. twice as great.
3. one-half as great.   4. three times as great.

---

12 x 12 =

Choose the word which was in the paragraph:

D   1) monarch   2) wide   3) dog   4) hurt

E   1) teeth   2) hamadrayd   3) worst   4) alive

F   1) annoy   2) man   3) reptile   4) blown

Which on of the following words did X , Y , or Z stand for in the preceding paragrap ?

1. crocodile

2. falcon

3. water buffal o

4. elephant

5. horse

6. cobra

7

The XY has a very thick central portion, the underside of which is called the mouth. From the central portion five pointed arms extend, which give it the general appearance of a X The spiny skin contains a deposit of lime which makes it hard and somewhat shell-like if the Y is removed from the water for a long time. When in the water, the X Y moves about quite freely. By means of a double row of sucker feet the XY is able to move about and to fasten itself firmly to objects.

·7

A. Choose the best title for the paragraph. 1 What the XY Looks Like 2 The Arms of the XY , 3 The Sucker-like Feet of the XY

B. How does the XY fasten itself to an object? 1 by its five-pointed arms 2 by its sucker-like feet 3 by its mouth....................... B

C. In the water, the XY — 1 swims about easily 2 fastens itself to a rock 3 cannot swim because of its spiny skin.................. C

$(7 + 14) \div 7 =$

Choose the word which was in the paragraph:

D 1) bottom 2) feeler 3) feet

E 1) shell-like 2) look 3) back-bone

F 1) lemon 2) shrimp 3) mouth

Which on of the following words did X , Y , or Z stand for in the preceding

paragrac ?

1. starfish

2. zebra

3. snake

4. porpoise

5. crocodile

6. turtle

8. If you will look carefully at the X Y Z
, you will find that it sends out many little fine shoots or tendrils which attach themselves to rough places in the wall. If there were only one or even just a few of these tendrils, they could not support the Z . However, there are a great many of them and each holds a little; so they are able to support heavy Z .

8

A. Choose the best title for the paragraph.
    1 How Y Shoots Grow   2 The Way Y
    Climbs Walls   3 The Tendrils on YZ .

B. What makes it possible for an Y Z to climb
   up a brick wall?   1 tendrils   2 suction cups
   on the leaves   3 a sticky substance. . . . . . B.

C. The heavy Z clings to the wall because —
   1 one of the shoots holds it
   2 many of the shoots hold it   3 the leaves
   attach themselves to the wall. C

$$201 + 93 =$$

Choose the word which was in the paragraph:

D   1) observe   2) watch   3) could

E   1) small   2) only   3) big

F   1) hold   2) support   3) vine

Which on of the following words did X , Y , or Z stand for in the preceding

paragrap ?

1. crossbow

2. snow

3. fish

4. creeping ivy

5. maple tree

6. bacteria

9. The XY has been so named because of the long, X like snout with which it defends itself and secures its food. In shape its body is much like that of a mackerel. It reaches a length of four to fifteen feet, and weighs from one hundred fifty to six hundred pounds. The X , which is sometimes three feet long, is formed by the prolonged and toughened bone of the upper jaw. It is usually somewhat flattened and has a very sharp point.

9

A. Choose the best title for the paragraph. 1 How the XY Fights 2 The Weight of the XY 3 How the XY Gets Its Name A

B. How long does the bony snout of the XY sometimes grow? 1 six feet 2 three feet 3 fifteen feet........................... B

C. A full-grown XY usually weighs — 1 three to fifteen pounds 2 fifty to one hundred pounds 3 one hundred fifty to six hundred pounds .. c

71 - 43 =

Which of these words occures in the paragraph:

D 1) mackerel 2) fish 3) tuna

E 1) fore 2) four 3) five

F 1) sores 2) sources 3) secures

Which on of the following words did X . Y . or Z stand for in the preceding

paragrao ?

1. turtle

2. swordfish

3. octopus

4. dog

5. **cobra**

6. elephant

10. The   XYZ   is put to many uses. The natives make paper, twine, ropes, and brushes from the fiber. The shell is used for ladles and cups. The young leaves are eaten like cabbage. Baskets, fans, and fish nets are made from the mature leaves. The trunk is used for canoes and posts.

10

A. Choose the best title for the paragraph.
1 Uses of the XY 2 Native Canoes
3 Palm-Leaf Baskets........................A

B. The natives use the leaves of the XY to make— 1 cups 2 canoes 3 baskets.....B

C. The trunks of the YZ are used to make—
1 fish nets 2 native canoes 3 fans........C

$$199 + 31 =$$

Which of these words occured in the paragraph:

D 1) walls 2) cups 3) shal

E 1) made 2) post 3) make

F 1) digestable 2) noose 3) ladles

Which gr of the following words did X , Y , or Z stand for in the preceding paragrap ?

1. elephant

2. hair

3. palm tree

4. mackerel

5. tomatoes

6. rosebush

11,   X   culture is not unlike that of corn and potatoes.   Fields are plowed and fertilized and the seed is dropped in hills.   X   planting begins in February and frequently continues for two months.   During May and June, when corn is just being planted, the   X   plants are ready to be cultivated,   This is done with a hoe and is called   Y X   At this time the rows are thinned by cutting out the poorer plants.   During the latter part of September   X Z   begins.

11

A. Choose the best title for the paragraph.
1 Planting   X   2   YX
3 Producing   X   ....**A**

B. During what month is   X   planting usually begun in
the South?   1 September   2 February
3 May........................**B**

C. Growing corn in the corn belt is much like growing
X   in the South because —   1 the seed is planted
in hills in plowed fields   2 planting of both is done
at the same period   3 both are cultivated by hand c

198 - 93 =

Which of these words occured in the paragraph

D   1. Harvest   2. Dropped   3. Yield   4. Crop

E   1. Just   2. Being   3. Grown   4. South

F   1. Continues 2. Wheat   3. Carrots   4. Before

Which an of the following words did X , Y , or Z stand for in the preceding

paragrap ?

1. mushrooms

2. cotton

3. goosedown

4. wool

5. fibre

6. orange grove

12. The X Y movement has spread from its first organization in 1907 until fifty-seven countries, representing over 90 per cent of the population of the world, have adopted the Y program. Y

Z dot every corner of our own country. More than 800,000 Y from Maine to California are doing their daily AB

12

A. Choose the best title for the paragraph.   1 Spread
    of the   X Y   Movement   2 Importance of
        Y   3 First Organization of   X Y Z

B. In how many countries are   X Y Z
    organized?   1 the United States only
        2 90 countries   3 57 countries .... B

C. The number of   Y   in the United States is more
    than — 1 300,000   2 800,000   3 1,600,000 c

19 - 40 =

Which of these words occured in the paragraph:

D   1. Proportion   2. Joined   3. Corner

E   1. Per cent   2. Knowlege   3. Consisting

F   1. Roots   2. Vermont   3. Fifty-seven

Which cr of the following words did X , Y , or Z stand for in the preceding paragrac ?

1. tuberculosis

2. violence

3. insurance

4. Boy Scouts

5. Book of the Month

6. coal mining

13. X grows in the cold-temperature belts. X can stand cold and drought pretty well; but a fair amount of rain is necessary in order to have a good quality of X . Growing X and getting the fiber from it when it is grown are both hard, slow tasks. Fields of X have to be weeded carefully by hand. The stalks also have to be softened under water by letting them decay before the fibers can be pulled off the woody core of the stalk.

13

A. Choose the best title for the paragraph.
   1 The Nature of X   2 Temperature Needed
   for X   3 Conditions for Growing   X

B. Why is the production of X   slow and
   expensive?   1 It must be protected from
   cold.   2 It must be cultivated by hand.
   3 It must have plenty of water............. B

C. The fibers of X   can be separated only — 1 during
   the rainy season   2 when the stalks have been
   soaked in water   3 after they have been frosted c

298 + 3 =

Which of these words occured in the paragraph:

D   1 . Fair   2. Gold   3. Moisture   4. Ropes

E   1. Stems   2. Both   3. Agriculture   4. Enzymes

F   1. Order   2. Pruned 3. Expensive   4. Decompose

Which on of the following words did X , Y , or Z stand for in the preceding paragrap ?

1. flax

2. flue

3. mellous

4. bread

5. cats

6. hair

14. X Y often bring large amounts of fine rock waste to the surface with the steaming water. This waste is then deposited around the opening of the Y where in time it forms a hard mound several feet high with a crater in the center. Although seldom over sixty feet in height, the resemblance of these Z to true A has given them the name of " B A ."

14

A. Choose the best title for the paragraph.
  1 How   X Y   Are Formed   2 How   B
      A   Are Made   3 Height of   A

B. What forms the crater-like openings around   X
      Y   1 rock deposits   2 soft mud
  3 petrified wood .... B

C. Few   B A   exceed a height of —
  1 sixty feet   2 six inches   3 six feet .. c

1989 — 1899 =

Which of these words occured in the paragraph:

D   1. Tall   2. Even   3. Time   4. Stream

E   1. Measured   2. Lava   3. Surface   4. Like

F   1. Forms   2. Create   3. Earth   4. Knoll

Which on of the following words did X , Y , or Z stand for in the preceding

paragrac ?

1. oxygen

2. lamps

3. pump

4. pump

5. cuspidor

6. hot springs

16. Before 1880 only a few thousand   X
came to this country from Y   After the above
year they began to come in large numbers. The
number varied from year to year, but often it ran
into the hundreds of thousands. Most of the Y

    X   came from southern Y , where the popu-
lation is very dense and where living conditions are
very poor. Today there are more   Y   in New
York City than in   Z . The   Y X
do not all remain in New York but may be found in
almost every American city.

16

A. Choose the best title for the paragraph. 1 X
    Y   to America 2 How Y   Come to
This Country 3 Why Y   Come to New York A

B. Which of these cities has the largest Y popu-
lation? 1 Z   2 San Francisco 3 New York B

C.   X Y   to this country was heaviest
from — 1 southern Y   2 northern Y
    3 central Y C

(11 x 11)+ 9 =

Which of these words occured in the paragraph:

D 1. Century 2. Come 3. Profound 4. Mixture

E 1. Sicily 2. Posessions 3. Today 4. Palermo

F 1. Above 2. Million 3. Courage 4. Stream

Which of the following words did X , Y , or Z stand for in the preceding
paragraph?

       1. horses

       2. botanical gardens

       3. cotton

       4. Salvation Army

       5. Italian immigrants

       6. Baroque art