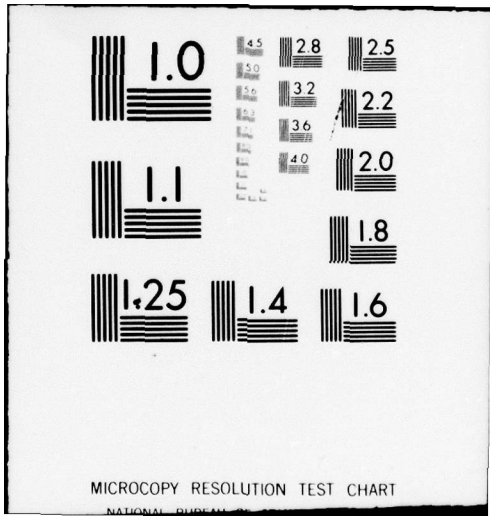
AD-A073 773 ARIZONA UNIV TUCSON DEPT OF PSYCHOLOGY F/G 5/10
INITIAL MENTION AS A CUE TO THE MAIN IDEA AND THE MAIN ITEM OF --ETC(U)
JUL 79 D E KIERAS N00014-78-C-0509
UNCLASSIFIED TR-3 NL

| OF |
ADA
073773

END
DATE
FILMED
10 -79
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
MICROCOPY RESOLUTION TEST CHART

LEVEL II

12 B.S.

Initial Mention as a Cue to the Main Idea and the Main Item of a Technical Passage

AD A073773

David E. Kieras
Department of Psychology, University of Arizona
Tucson, Arizona 85721

DDC RECEIVED SEP 13 1979 C

DDC FILE COPY

Technical Report No. 3
July 23, 1979

This research was supported by the Personnel and Training Research Programs, Office of Naval Research, under Contract Number N00014-78-C-0509, Contract Authority Identification Number NR 157-423. in whole or in part is permitted for any purpose of the United States Government.

Approved for Public Release; Distribution Unlimited

79 09 13 080

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: Technical Report No. 3
2. GOVT ACCESSION NO.: ---
3. RECIPIENT'S CATALOG NUMBER: ---

4. TITLE (and Subtitle): Initial mention as a cue to the main idea and main item of a technical passage, the

5. TYPE OF REPORT & PERIOD COVERED: Technical Report, July 25, 1979

6. PERFORMING ORG. REPORT NUMBER:

7. AUTHOR(s): David E. Kieras

8. CONTRACT OR GRANT NUMBER(s): N00014-78-C-0509

9. PERFORMING ORGANIZATION NAME AND ADDRESS:
Department of Psychology
University of Arizona
Tucson, AZ 85721

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
61153N; RR 042-06
RR 042-06-02;
NR 157-423

11. CONTROLLING OFFICE NAME AND ADDRESS:
Personnel and Training Research Programs
Office of Naval Research (Code 458)
Arlington, VA 22217

12. REPORT DATE: 23 July 1979

13. NUMBER OF PAGES: 52

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): TR-3 53 p.

15. SECURITY CLASS. (of this report): unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; Distribution Unlimited

DDC RECEIVED SEP 13 1979 C

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report): RR 042 06

18. SUPPLEMENTARY NOTES: RR 042 06 02

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Reading, Comprehension, Abstraction

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Information near the beginning of a passage has often been reported to be recalled better, with the explanation being that the most important information in a passage is recalled better, and this information usually appears early in a passage. But this usual position for important information suggests that there is a linguistic convention that such information normally should appear in an initial position, meaning that the reader expects to find it there. If so, initially appearing information may tend to be viewed as important simply as a

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE
S/N 0102-014-6601 |

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

411 085

result of its position. Whether initial mention could play this role as a signal to the important, or thematic, content of a passage was determined with five experiments in which readers reported what they thought was the main idea or the main item of technical passages. The first two experiments show that in normal or natural passages, statements of the main idea tend to be based on initially mentioned sentences. The third experiment unconfounded content and position by using passages in which the main idea was expressed by a sentence which appeared either first in the passage, or embedded in the middle of the passage. Statements of the main idea resembled the intended theme sentence to a greater extent if this sentence appeared first than if it was embedded. The fourth and fifth experiments showed that statements of the main item tended to name the major referent that appeared first in the passage. Conceptual superordination and sentence surface subject position were influential as well. The results suggest that readers base much of their abstractive processes on the semantic content of a passage, with superficial features such as initial mention serving to guide or influence these processes.

Accession For
NTIS GRA&I
DDC TAB
Unannounced
Justification
By
Distribution/
Availability Codes
Dist | Avail and/or special
A

Initial Mention as a Cue to the Main Idea and the Main Item of a Technical Passage

David E. Kieras
Department of Psychology, University of Arizona
Tucson, Arizona 85721

Technical Report No. 3
July 23, 1979

This research was supported by the Personnel and Training Research Programs, Office of Naval Research, under Contract Number N00014-78-C-0509, Contract Authority Identification Number NR 157-423. Reproduction in whole or in part is permitted for any purpose of the United States Government.

Approved for Public Release; Distribution Unlimited

Abstract

Information near the beginning of a passage has often been reported to be recalled better, with the explanation being that the most important information in a passage is recalled better, and this information usually appears early in a passage. But this usual position for important information suggests that there is a linguistic convention that such information normally should appear in an initial position, meaning that the reader expects to find it there. If so, initially appearing information may tend to be viewed as important simply as a result of its position. Whether initial mention could play this role as a signal to the important, or thematic, content of a passage was determined with five experiments in which readers reported what they thought was the main idea or the main item of technical passages. The first two experiments show that in normal or natural passages, statements of the main idea tend to be based on initially mentioned sentences. The third experiment unconfounded content and position by using passages in which the main idea was expressed by a sentence which appeared either first in the passage, or embedded in the middle of the passage. Statements of the main idea resembled the intended theme sentence to a greater extent if this sentence appeared first than if it was embedded. The fourth and fifth experiments showed that statements of the main item tended to name the major referent that appeared first in the passage. Conceptual superordination and sentence surface subject position were influential as well. The results suggest that readers base much of their abstractive processes on the semantic content of a passage, with superficial features such as initial mention serving to guide or influence these processes.

Acknowledgments

Thanks are due to Susan Bovair, Mark Stempski, Alena Fogl, Shawn Duff, and Lorinda Silver for assistance in preparing and conducting the experiments, analyzing the data, and preparing this report.

Initial Mention as a Cue to the Main Idea and the Main Item of a Technical Passage

David E. Kieras

It has been shown that in memory for prose, information near the beginning of a passage is recalled better. One of the earliest demonstrations of this fact was provided by Deese and Kaufman(1957) who showed that as word lists became closer approximations to English prose, the normal serial position curve for word list recall lost its recency portion, while the primacy portion of the curve became more exaggerated. Hence the first part of the passage was recalled better. Similar primacy effects for organized prose have appeared in more modern work (e.g., Frase, 1969; Meyer & McConkie, 1973; de Villiers, 1974), usually in the context of the "levels effect." This effect, which has been reported frequently (e.g., Johnson, 1970; Kintsch, Kozminsky, Streby, McKoon, & Keenan, 1975; Thorndyke, 1977), is that information that is at a higher level of importance in the content structure of a passage is recalled better. That is, the more important a piece of information in the passage is, the better it is recalled. As pointed out by Meyer(1977), the levels effect can be used to explain the better recall of initially mentioned information: Since the more important information usually appears first in the passage, this information will be recalled better due to its importance. Additional support for this explanation appears in the Kintsch et al. study. The more superordinate propositions did tend to have earlier positions in the passages.

However, perhaps there is a linguistic convention that the initial position itself acts as a cue to importance, and so the most important information should appear there. Hence, rather than important content merely happening to appear first, the composer of a passage normally places the important information there to ensure that the reader will identify it as important immediately upon beginning to read the passage. In fact, we are taught throughout our training in writing that a paragraph should usually begin with a "topic sentence." Thus, rather than a phenomenon to be explained away, the better recall of initial

material is in fact a clue to how readers identify the important content of a passage. Hence, attention can be focused away from effects on recall to effects on the reader's immediate perception of the theme or topic.

Some support for the importance of initial mention comes from the special status given to the initial portion of a passage by most theorists of prose comprehension. For example, Carpenter and Just(1977) postulate a "discourse pointer" whose initial state is determined by the initial portion of a passage. From theories of prose comprehension based on schema ideas (e.g., Thorndyke, 1977, 1979), we would expect that the main subject should appear early in the passage to enable the reader to activate the relevant portions of his general knowledge, or to perform the initial step of selecting the proper schema. Others point out that initially presented information may be required to provide a contextual framework for the passage content (e.g., Bransford and Johnson, 1972), or to define the major passage referents (Clark & Haviland, 1977). As discussed in more detail below, the Kintsch and van Dijk (1978) theory of prose comprehension is sensitive to the content of the first passage sentences that are read.

But the study of thematic content itself, independent of its superior recall, and how the reader identifies thematic content, has in fact just begun. A good theoretical basis is available in the form of the theory of text comprehension developed by Kintsch and van Dijk(1978), in particular, the concept of macro-structure and macro-operations (van Dijk 1977a, 1977b). In this view, a reader does not simply extract and store the explicit propositions from a text, and then stop. Rather, the reader goes on to construct macro-propositions which state the actual gist or point of the passage, usually at a more global level, with the irrelevancies or details left out. The resulting macro-structure is considered by van Dijk and Kintsch to be the "topic" or "theme" of the passage. van Dijk(1979) has provided an informal taxonomy of some of the properties of a passage that govern what the reader considers as relevant. Although the macro-operations have been described only in terms of operations on the semantic content of the passage, these theme-signalling passage properties include not only the semantic content, but also surface-level features of the passage such as initial mention and the topic-comment structure of individual sentences.

Some of these theme-signalling or "staging" properties have been studied by Clements(1979) who obtained better recall of passage material if it was marked as important by these staging devices. Hence, the macro-processes that construct a representation of the thematic content of a passage could be guided or influenced in their operation by the surface-level features of the passage, such as what is initially mentioned or what appears as sentence topics.

In the process model proposed by Kintsch and van Dijk (1978), there are ways in which initial mention would affect the comprehension process even in the absence of specific macro-processes. In their model, the first propositions to be read in are held in a limited working memory whose later contents are heavily influenced by the relation of later input to what is already being held. Hence the first information from the passage can strongly influence what is later considered coherent and thereby, what should be stored for later recall. Hence, if this theory captures some of the major features of comprehension processes, we would expect that there would be a convention that the first-appearing information in a passage should be suitable for this role by being important or central to the passage content.

However, there is very little <u>direct</u> evidence that readers consider initially presented information as thematic, or what the passage is about. One study that does provide such direct evidence for an initial position convention appears in Kieras(1978), who used a direct measure of the thematic content of a passage. Subjects read simple passages one sentence at a time, and then reproduced from memory the presented sentence that they thought "would make the best title." The overwhelming favorite choice was the sentence that stood at the central position in the propositional structure of the passage. But, if this sentence appeared first, it was chosen as the apparent theme more often than if it appeared last. Hence initial position enhanced the perceived thematic value of the most thematic sentence.

Hence, there is good reason to think that there is a linguistic convention that thematic or important passage content should appear first in the passage. Consequently, a reader may tend to consider the first information in a passage as important, regardless, to some extent, of its actual importance in the passage as a whole. Clearly a reader's decision as to the importance of various parts of a passage will be

based on many factors, as pointed out by van Dijk's(1979) taxonomy and the several staging devices studied by Clements(1979). Hence as suggested by the Kieras (1978) results, initial position can be expected to influence, but not completely determine, what the reader considers to be thematic.

This paper extends the earlier work in Kieras (1978) with five simple experiments on the role of initial position in readers' judgements of the theme of a passage. Rather than simple passages as in Kieras(1978), these experiments used passages of natural origin or complexity, being either taken verbatim from Scientific American, or of similar style and content. Before these experiments can be described, it is necessary to justify the methodological approach used in these studies, in which direct statements of the main idea or main item of a passage are the data source, rather than the traditional recall measures.

First, it should be noted that most of the results available in the literature on the importance of various parts of a passage or passage content have been based on recall measures. When other measures have been used (e.g., Johnson, 1970; Clements, 1979), it has usually been only in a secondary role relative to recall measures. Now if the primary concern of prose comprehension research is educational relevance, then the dependent variable of recall is the obvious choice, since presumably a student's task is to remember the content of what he or she has read. However, since storage and retrieval operations and some time delay are involved in a recall task, this measure does not tap very directly into the immediate products of comprehension. If, as seems likely, identifying the theme of a passage is a process that can occur early in comprehension, a more immediate and pure measure of the perceived theme is needed. Furthermore, there are many real-world reading situations in which the reader must classify written material or look for the desired material in a larger piece of prose such as a technical manual. In fact, Sticht (1977) found that in a military work environment, textual materials were more often used as reference sources, rather than as material to be learned for later recall.

The goal of these experiments was to understand how readers identify the important content of a passage; hence, what was needed was a measure of what they think is important that reflects the immediate

results of theme identification processes going on during comprehension, and not the combined products of comprehension, storage, and retrieval operations. Thus, the methodology used was essentially that of asking subjects to report only the key portion of the macro-structure that they had constructed for the passage. This was done by simply asking subjects to report what they thought was the important content of the passage immediately after reading it. To keep memory load to a minimum, the the content of their responses was limited in quantity, and the time delay was very short.

A second methodological issue concerns the basic form of the subject's report. There has been little attention paid to just what the form of thematic information is. The Kintsch and van Dijk theory simply associates the entire macro-structure with the discourse topic. But a simple analysis (Kieras, Note 1) suggests that a reader can report either the main idea of a passage, that is, the main proposition, or the main item, which would be the main referent under discussion (cf. van Dijk, 1979). Kieras (Note 1) found that subjects could produce well-behaved reports of either main items or main ideas. A main idea report was obtained by asking subjects to produce a statement in the form of a brief complete sentence, and a main item report was obtained by asking for a title-like response in the form of a noun phrase. The two report forms are closely related, as would be expected (e.g., see van Dijk, 1979). The main idea statements tended to be about the main items, in that popular main items tended to appear as the surface subject noun phrases of the main idea statements. The results reported here on initial mention make use of both the main idea procedure and the main item procedure.

Using two different measures of thematic content, the first two experiments demonstrate the fact that the information that readers consider important or thematic usually does appear early in the passage. The third experiment, using passages whose sentence order was manipulated, shows how the thematic value of the very same sentence in a passage is enhanced by initial appearance. The fourth and fifth experiments showed that the preception of the main item of a passage was also influenced by initial mention. These experiments used passages with two candidate topics in which either of the two topics could be mentioned first in the passage. The initially-mentioned topic was

perceived as more thematic, with both a free generation of a single main item, and with a forced-choice between the two candidate topics.

EXPERIMENT 1

This was an preliminary experiment using fairly natural passages left-over from a previous experiment for which some normative ratings were desired. As part of these ratings, subjects were asked to select the most thematic sentence and to underline it on a copy of the passage.

Method

Materials. A set of six passages were used that were originally prepared for a previous unpublished experiment. These were passages that were written in a fairly literary expository style about various esoteric topics of a basically technical nature. The passage topics were the history of chess, the naval history of World War I, the ether theory of pre-Einsteinian physics, the interaction of Lysenko's evolutionary theories with the Russian political system, the errors in Albert Schweitzer's interpretation of Bach's organ music, and the rivalry between Edison and Tesla in early electrical technology. The passages ranged from 16 to 21 sentences in length, occupying about three-fourths of a typewritten page. Booklets were prepared with one passage to a page, with the passages appearing in random order. The bottom of each page contained three rating scales, for familiarity, comprehensibility, and visualizability. The cover page of the booklet contained the instructions.

Design, Subjects, and Procedure. Each subject read and responded to each of the six passages. The subjects were 23 University of Arizona students enrolled in an introductory psychology class who participated in the experiment for extra credit. The subjects were run in groups, and were simply given the booklet and asked to read the instructions and then to procede. The instructions described the basis for the rating scale judgements, which are of no concern here, and then instructed subjects that after they completed the ratings, they should read the passage again, and then "pick the ONE sentence that you think expresses the main idea, or the most important information, in the passage," and then underline this sentence.

Results and Discussion

The number of sentences underlined at each position in the passages was counted. The results are shown in Figure 1. Since the passages had different number of sentences, the distribution of choices is shown from each end of the passages, with all others being counted as "middle." As is clear from the figure, the choices were predominantly sentences first or early in the passage, although some subjects chose sentences elsewhere in the passage. As a statistical check on the reliability of this result, the distribution of choices for each passage was compared to a flat distribution over the passage sentences using chi-square tests for goodness of fit. In all six cases the observed distribution deviated significantly from a flat distribution (all $ps < .01$).

While the results of this experiment show rather clearly that thematic information does appear early in a passage, there are two problems: (a) These passages, since they were composed specifically for experimental purposes, might have unnaturally strong topic sentences, with unnatural consistency in initial position. (b) The sentence underlining technique, while methodologically simple, does not allow the subject much freedom of choice in response.

EXPERIMENT 2

This experiment used naturally occurring passages to determine whether "real world" passages would also have their thematic content appearing at the beginning of the passage. These passages were also considerably shorter as well. The subjects indicated what they thought was thematic by generating a statement of the main idea in the form of a simple sentence. To ensure that subjects did not indulge in responses that were too free-wheeling, the instructions required that the statement meet certain constraints on form, and stick fairly close to the passage content.

The experiment and its results are an excerpt from a larger study on the relation of statements of the main idea and of the main items in naturally occuring technical passages (Kieras, Note 1). A side result of the study was the set of results on initial position effects reported here. Only the details of the study relevant to this issue are described in the paper. Note that since the only manipulation in the full study was a between-subjects manipulation, and the results reported

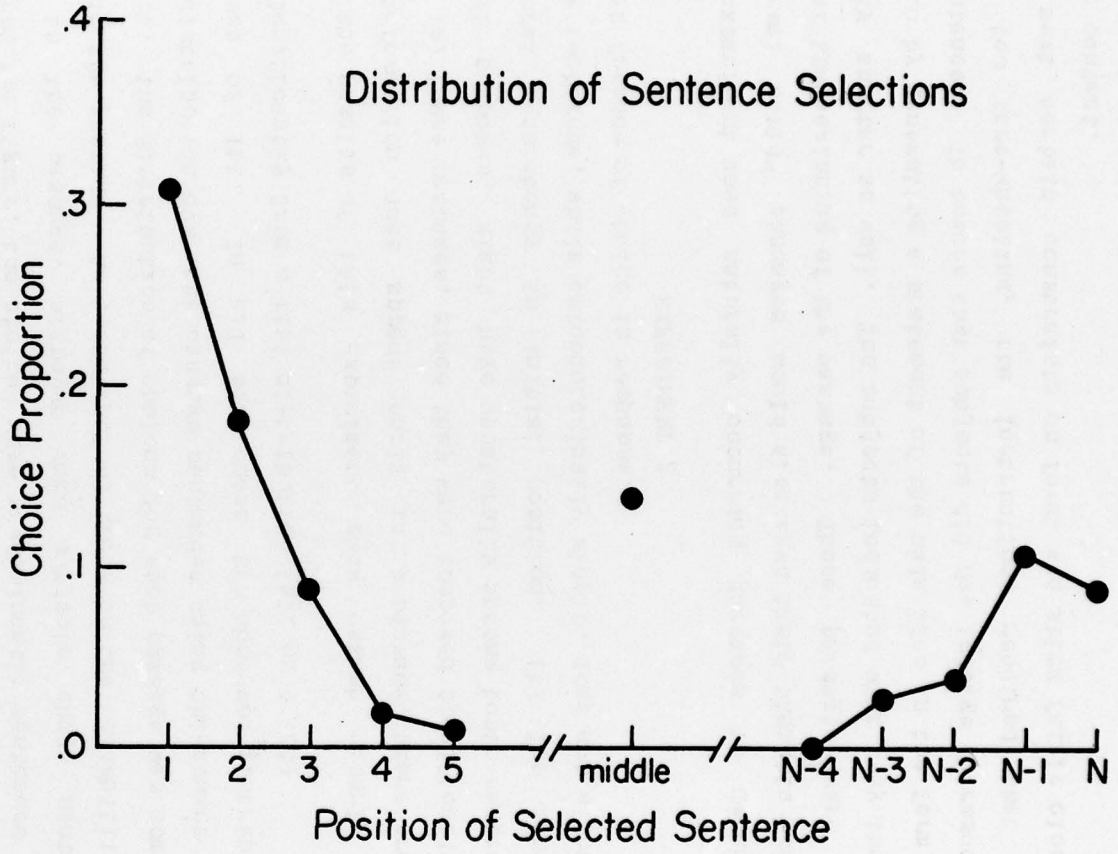


Figure 1. Distribution of sentences choices.

here are for a single one of the groups, this set of results can stand alone.

Method

Materials. The passages were complete verbatim passages from articles appearing in Scientific American. Thirty passages were selected that were about 2 to 2.5 inches long in print, appeared to be about one basic thing, and were comprehensible in isolation. The passages were photoduplicated onto slips of paper, and assembled into booklets containing one passage per page, with the 30 passages appearing in random order in each booklet.

Design and Subjects. Each subject read and responded to each passage. The group of 30 subjects were University of Arizona students of either sex recruited through campus advertisements. They were paid $2.00 for participating.

Instructions. The theme instructions stated that subjects should produce "a single simple sentence that states what you think is the most important idea actually expressed in the passage." A set of rules was provided for this "main idea sentence" with examples of right and wrong responses: (1) "It must be a single sentence, not two or three." (2) "It must be a simple sentence that fits into the space provided on the page underneath the passage." This rule encouraged brief statements rather than complex all-inclusive summaries. (3) "It must be a complete sentence, not a word or phrase." (4) "... your sentence must express an idea that was actually mentioned in the passage." This rule was elaborated to discourage "making up" a "creative" title based on conclusions or inferences. But the instructions stated that "this does not mean that we want you to simply copy a sentence from the passage; your response should express the main idea in a simple compact form. Sometimes actual sentences from the passage will do this, but most of the time they won't."

Procedure. Subjects were run in groups. After reading a written set of instructions, subjects were questioned by the experimenter to ensure understanding. Then subjects proceeded through their booklets at their own pace, writing their theme responses on the booklet pages below the passage. The first few responses from subjects were usually checked by the experimenter to ensure that the subject was producing responses

that met the form constraints in the instructions. On the relatively few times when subjects were violating the instructions, the relevant parts of the written instructions were pointed out to the subject, and the form rules emphasized. This intervention was never performed after the subject had progressed past the first few passages.

Results

Response categorization. The responses supplied by the subjects were scored by means of a simple categorizing system, described as follows: The booklets were dismantled and the pages regrouped by passages. Each page thus had a single subject's response to a single passage. For each passage, the responses were sorted into categories that met the simple criterion of simply belonging together in terms of similarity. No restrictions were placed on the number of categories or the number of responses in each. Single member categories were thus defined if needed. Preliminary trials indicated that this method was fairly reliable in that there was a high degree of similarity between responses in the same category. One person thus performed the categorizations for all responses. Once the categories had been defined, the sorter picked a typical instance from each category to serve as the prototype of the category. Thereafter, the entire set of responses in that category were respresented by the prototype.

The mean number of categories for theme responses was 8.2, with a range of 3 - 18. Approximately 4% of the theme responses were categorized as errors, in that the subject produced a response clearly inconsistent with the form constraints specified by the instructions, such as writing down a phrase rather than a complete sentence. Such errors were mostly produced by a very few subjects who simply failed to follow instructions.

The prototype theme responses were compared to the original passage, and were classified in terms of which sentence or sentences in the original passage they resembled. The wording and content of the theme prototype was compared to each sentence in the passage. If the theme prototype could be considered a subset of the wording and content of a single one of the passage sentences, it was classified as being taken from that sentence in the passage. If the theme contained wording or content from more than one of the passage sentences, it was classified as an integrative response. If it could not be identified as

coming from a particular set of sentences, it was classified as unrelated. The results are shown in Table 1. Since the passages had different numbers of sentences, Table 1 shows the distribution of theme sources for passages of all lengths, and the average distribution both unweighted, and weighted by the number of passages of each length.

The major feature of the results in Table 1 is an apparent preference for sentences in the first and third positions. This feature was tested by applying chi-square goodness-of-fit tests comparing a flat distribution to the obtained distribution of single sentence source frequencies (integrative and unrelated responses were not included) for each passage length. These chi-square values were all significant well beyond the .01 level except for passages of length 3, which was significant at only the .05 level. Hence, for all passage lengths, the apparent preferences for serial position are reliable. Whether position one appeared more often than position three was tested, using the frequencies for individual passages, and found to be nonsignificant ($t(28)=1.15$). Hence the first sentence is overall the favorite source of themes, but apparently the third sentence in these passages also carries content subjects often consider to be thematic.

Discussion

The first two experiments agree in showing that thematic information most often appears first, and also that it is often found elsewhere in the passage. Hence a complete explanation of how readers identify thematic information will clearly have to incorporate the other properties of passage information mentioned above besides whether it appears in the initial position. However, the frequent appearance of thematic information first in the passage is a strong suggestion that readers expect it to be there. But it must be demonstrated that initial position in itself will contribute to the thematic importance of passage information. This is done in the next experiment.

EXPERIMENT 3

This experiment used some of the passages from Experiment 2 modified into two forms. In one version, the sentence expressing the theme appeared first; in the other version, this very same sentence was embedded in the middle of the passage. Subjects produced statements of the main idea, similar to the task of Experiment 2. Reading times and response generation times were also measured, to see if the initial

Table 1

Proportion of Theme Choices from Each Sentence Position

	Sentence Position							
Number	1	2	3	4	5	6	Integ.	Unrel.
1	.77	.07					.10	.07
6	.25	.18	.33				.19	.05
12	.33	.11	.16	.15			.22	.03
10	.28	.09	.14	.05	.08		.32	.04
1	.30	.00	.27	.00	.00	.00	.33	.10
Unweighted Mean	.39	.09	.23	.01	.04	.00	.23	.06
Weighted Mean	.30	.11	.19	.10	.07	.00	.24	.05

Note. The columns labelled Integ. and Unrel. indicate the proportions of theme choices that were scored as Integrated or Unrelated.

position of the theme would lead to faster identification of the thematic information.

Method

Materials. A set of 16 passages, each in two versions, was prepared. One version had the theme sentence appearing first, the other version had the theme appearing in the middle of the passage. The passages were composed using the passages from Experiment 2; passages were selected that had fairly uniform theme statements; such passages would thus have strong or definite themes. The passages were modified as necessary to ensure that the most popular theme choice was explicitly expressed by one of the passage sentences, and to enable the theme sentence to be placed in either the first or embedded position without seriously damaging the coherence or readability of the passage. Table 2 presents an example of the two versions of one of the passages. The passages were computer-justified to fill 80-character lines, and averaged about 10 lines in length.

Design. The theme position factor was both within-subject and within-passage. Each subject read each of the 16 passages, eight of them in a theme-first version, and eight in the theme-embedded version. The passages were assigned to theme position conditions at random for each subject, with consecutive pairs of subjects seeing complementary versions. This ensured that if an even number of subjects were run each passage would appear equally often in the two versions. The order in which the passages appeared was also randomized for each subject.

Subjects. Forty University of Arizona students of either sex served as subjects in return for $2.00. Five subjects who either failed to follow instructions or did not finish in the one-hour session time available were replaced with new subjects who read the same versions of each passage as the original subjects.

Equipment and Procedure. A Data General MicroNOVA laboratory computer was used to generate the randomized passage sequences, display the passages, collect the responses, and collect reading and response times (Kieras, 1979). Up to two subjects were run concurrently. Each subject sat in a booth at an 80 character X 24 line upper/lower-case Teleray video terminal driven at 9600 Baud. When the subject tapped the space bar in response to a prompting message, the passage appeared on

Table 2

Example of the Two Versions of a Passage

Theme-First Version

Subtle variations in the appearance of a color result from differences in the composition and texture of the surface. The same hue will not look the same on surfaces made of plastic, wood, metal, paper and cloth. In addition to variations due to the material's composition and texture, new color attributes emerge with surface colors. Metallic colors such as gold, copper and silver are new color attributes that appear with the perception of a surface color. Surface colors may vary along dimensions from glossy to matte, transparent to opaque, and fluorescent to nonfluorescent.

Theme-Embedded Version

Surface colors may vary along dimensions from glossy to matte, transparent to opaque, and fluorescent to nonfluorescent. The same hue will not look the same on surfaces made of plastic, wood, metal, paper and cloth. Subtle variations in the appearance of a color result from differences in the composition and texture of the surface. In addition to variations due to the material's composition and texture, new color attributes emerge with surface colors. Metallic colors such as gold, copper and silver are new color attributes that appear with the perception of a surface color.

---

the screen. When the subject was finished reading, he or she tapped the space bar again, which caused the passage to disappear, and a response prompting message to appear. The subject then typed in his or her main idea statement on the terminal keyboard. The statements were limited to 80 characters in length, which ensured that subjects had to prepare a reasonably brief and concise response. After entering their response, the original prompt message appeared, and the subject could procede to the next passage when ready to do so. The computer recorded the typewritten responses, along with the time spent in reading the passages and typing the responses. The times were recorded to the nearest second.

Before beginning the experiment, the subject practiced using the terminal keyboard to become acquainted with how their responses were to be entered. Arrangements were made with the few subjects who did not like to type to write their responses by hand on a notepad. When ready to begin, the subjects read a set of written instructions, and were checked to ensure understanding. The subject then proceded to read and respond to the 16 passages in the experiment.

Instructions. The instructions were prepared on the basis of earlier experiments to ensure a reasonable consistency in the form of the responses from different subjects, and were very similar to those used in Experiment 2. Subjects were told that their response should state what they thought was the "main idea expressed in each passage." This was specified in more detail by a set of four rules for the response: (1) "It must be a single sentence, not two or three." (2) "It must be a simple sentence that will fit on one line on the computer terminal." (3) "It must be a complete sentence, not a word or phrase." An example was given to ensure that subjects understood the distinction. (4) "...your sentence must express an idea that was actually mentioned in the passage." This was elaborated to discourage subjects from using "creative ideas, inferences, deductions, or conclusions," but that simply copying a sentence from the passage was not expected either. Finally subjects were asked not to pause or waste time while the passage was on the screen.

Results and Discussion

Reading and Typing Times. The average reading and typing times for each subject in each of the two theme position conditions were determined. The reading times averaged 58.3 seconds for the theme-first condition, and 60.1 seconds for the theme-embedded condition. Although this difference is in the right direction, it failed to approach significance ($F<1$). The typing times were 56.4 and 55.3 seconds for theme-first and theme-embedded; this difference also failed to approach significance($F<1$), and in any event, is in the wrong direction. Apparently, under these conditions, strong differences in processing time due to theme position simply do not appear.

Theme Responses. The main idea statements were rated on a 0-5 scale by two independent raters for similarity to the intended theme sentence, and to the alternate first sentence, which was the sentence that appeared first in the theme-embedded versions. Hence each rater gave each response two ratings, one for each similarity criterion. These ratings were done blind with respect to the version of the passage that had been presented. The mean ratings, collapsed across rater, are shown in Table 3. The ratings were collapsed across passages for each subject, and subjected to an ANOVA in which rater, theme position, and similarity criterion were the factors.

As shown in the table, the responses were overall more similar to the intended theme than to the alternate first sentence ($F(1,39)=222$, $p<.01$). There was no main effect of theme position($F<1$). The key result is a strong interaction between the similarity criterion and the theme position ($F(1,39)=23.44$, $p<.01$). That is, the responses were more similar to the theme sentence if the theme appeared first than if it was embedded. However, the responses were more similar to the alternate first sentence when it appeared first, as in the theme-embedded condition, than when it appeared later in the passage, as in the theme-first condition.

There was a main effect of rater ($F(1,39)=5.37$, $p<.05$) and an interaction of rater with criterion ($F(1,39)=5.92$, $p<.05$), and with the other two factors ($F(1,39)=5.40$, $p<.05$). This presents no problem with interpretation, however, since the two raters showed identical patterns of ratings for the means corresponding to those in Table 3.

Table 3

Similarity Ratings of Main Idea Statements

Similarity Criterion	Theme Position	
	First	Embedded
Intended Theme Sentence	2.48	2.11
Alternate First Sentence	1.04	1.38

Note. The MSE for these means is 0.43.

These results show that subjects tend to rely on the initially mentioned item in choosing the main idea of a passage. As remarked above, there are clearly many other factors taken into account. In this experiment, these other factors were clearly at work in that subjects did not simply copy the first sentence, but usually devised main idea statements that drew on many parts of the passage. However, the influence of the very same passage sentence on this process was greater if it appeared in the initial position.

EXPERIMENT 4

The above experiments demonstrate the importance of initial mention as an influence on the thematic value of passage content, as measured by statements of the main idea of a passage. Demonstrating a similar effect on statements of the main item, however, requires some careful consideration of the experimental materials. As suggested by the Perfetti and Goldman studies (1974, 1975), the main item of a passage may be simply the most frequently mentioned referent, and as shown in Kieras (Note 1), identification of a main item can be very simple compared to identifying the main idea. Hence, passages that contain only one frequently mentioned item will be easily perceived as having that one item as a topic, regardless of the sentence ordering. Hence, demonstrating the effects of initial mention on main item choice requires some tactic other than using normal, well-formed, passages in which a single item is the topic of the bulk of the sentences.

The simplest way around this difficulty was to use carefully constructed passages that contained two candidate topics, A and B, of equal salience, described in such a way that either topic could be mentioned first in the passage without disruption of coherence. Each passage consisted of two sentences about Topic A, followed by a linking sentence that connected topic A to topic B, followed by two sentences about topic B. Which topic was initially mentioned could be changed by placing the two topic B sentences first, followed by the linking sentence, and placing the two topic A sentences last. An example of the two versions of such a passage are shown in Table 4.

It must be acknowledged that such passages are rather unnatural. But, the use of unnatural materials to achieve experimental control in the study of verbal processes is an accepted strategy in psychological research. In a pilot study the passages often did strike readers as

Table 4

Example of a Two-Topic Passage

A-First Version

The development of the sea urchin begins when millions of microscopic eggs are ejected into the sea through pores in the spiny shell of the adult. The tiny embryonic sea urchin, which swims about freely and feeds on plankton, is so transparent that its internal structure is clearly visible. The skeleton of the sea urchin develops from two spicules which are made of biocrystals that eventually fuse to form a spherical shell. Structures such as bone, tooth, and shell are made up of biocrystals which are three-dimensional arrays of calcium, silicon and phosphate and carbonate. These biocrystals are chemically indistinguishable from crystals found in the inanimate world.

B-First Version

Structures such as bone, tooth, and shell are made up of biocrystals which are three-dimensional arrays of calcium, silicon and phosphate and carbonate. These biocrystals are chemically indistinguishable from crystals found in the inanimate world. The skeleton of the sea urchin develops from two spicules which are made of biocrystals that eventually fuse to form a spherical shell. The development of the sea urchin begins when millions of microscopic eggs are ejected into the sea through pores in the spiny shell of the adult. The tiny embryonic sea urchin, which swims about freely and feeds on plankton, is so transparent that its internal structure is clearly visible.

Note. Topic A is the sea urchin, and topic B is biocrystals.

being about both topics. The reported experiments consequently required subjects to pick a single item as the topic. However, despite the obvious double-topic quality of the passages, main item responses to them should be meaningful. That is, the reader's interpretation of the second of the two topics will be conditioned by having read about the first. Thus, in comprehending the passage, the propositions about the second topic will be processed in the context of the prior propositions about the first topic. Any macro-operations performed on the passage content would thus be likely to be more influenced by what was said about the first topic than about the second, and to consider the first topic as being more important to the macro-structure. Hence, if the reader is asked to decide which of the two candidate topics is the single topic, he or she would apply the macro-rules, and arrive at a decision that reflects the relative importance of the two candidate topics in the passage macrostructure, even if on the basis of writing conventions, the passage would be classified as defective because of the presence of two competing topics. Hence, studying the effect of initial position with these two-topic passages yields definite information about whether subjects consider the initially mentioned item as more topical, despite their unnatural and linguistically defective character.

A pilot study using very loose main item instructions indicated that although there were initial mention effects, many of the responses named both candidate topics. For this reason, these studies used instructions requiring only one topic be named. Furthermore, apparently through artifacts of composition, the topics labelled A tended to be preferred across the board to those labelled B. Although the label is clearly arbitrary, the passages were usually composed by starting with the A topic and then trying to develope a B topic that appeared to be of equal salience. This process could have resulted in the A topics being better in some way than the B topics. Needless to say, if the A and B labels had been assigned at random, this problem would probably not have been noticed. The preference bias produced an asymetrical initial mention effect. Topic A was chosen more often than B when A appeared first, but when B appeared first, A was still chosen more often than B, but not as much so. The bias could have resulted from two possible factors: The first was that A was usually the subject of the linking sentence that interconnected the two topics, and hence could have enjoyed an advantage over the B topics due to the relation of

topic-comment assignment at the sentence level to the passage topic (van Dijk, 1979). The second was that the A topics might differ from the B topics in terms of conceptual salience or generality in some way that was not adequately controlled. The first of the experiments, Experiment 4, controlled which topic appeared as the subject of the linking sentence. Experiment 5 controlled both this factor, and attempted to control the salience relationship between the two topics.

In Experiment 4 there were four conditions, each associated with one of four versions of the two-topic passages. Either topic A or topic B appeared first, and either topic A or topic B was the subject of the linking sentence. Subjects responded to the passages by writing down a statement of the main item of each passage.

Method

Materials and Design. A set of twenty double-topic passages of the form described above was prepared, with an additional two for use as practice passages. In the A-subject versions, topic A appeared as the surface subject of the linking sentences; the B-subject versions were prepared by rewriting the linking sentence so that topic B appeared as the subject. As described above, the A-first and B-first versions of the passages were obtained by putting the two sentences for the desired topic first, followed by the linking sentence, and ended by the two sentences about the other topic. The passages were computer-justified and printed out on a high-quality printer. Individual passages were then pasted onto index cards for use in the experiment.

The design was both within-subject and within-passages in that each subject saw passages in all conditions, and a version of each passage appeared in each condition. The passages were randomly assigned to conditions for each subject, using a randomization procedure that ensured that for groups of four consecutive subjects, each passage would appear once in each condition, and each subject would see each passage once.

Subjects. Forty students of either sex at the University of Arizona, who were recruited through campus advertisements, served as subjects in return for $2.00.

Procedure. The individually-run subjects were given the deck of passage cards and a set of printed instructions. They were instructed to read each passage and write down a title for it. The instructions strongly emphasized choosing as a title "the one thing that best represents the topic of the passage," even though the subject might feel that the passage was about two or more things. The subject then read and generated titles for two practice passages. If the subject produced titles that named two topics, he or she was directed to reread the instructions, with the single-topic rule being pointed out. Once the subject began the experimental passages, the responses were monitored, and he or she was again asked to reread the instructions if double-topic responses were produced. This intervention was performed only if the violation of the instructions was definite, and was not done more than twice; that is, after the second intervention, no further monitoring was done.

Results and Discussion

The responses were scored blind, without knowledge of the passage version that produced the individual responses. Hence any scoring biases should not distort the conclusions. A strict and a liberal scoring criterion were used. The strict scoring required verbatim or near-verbatim reproduction of one of the candidate topic names, while the liberal scoring allowed paraphrases that appeared to identify one of the topics. Very little difference in the scores from the two criteria appeared, so only the strict scoring results are reported here. The distribution of topic choice responses in the four conditions is shown in Table 5. A large number of responses named both topics, in spite of the single-topic rule of the instructions. This would be expected from the basic unnaturalness of the passages discussed above. However, the bulk of the responses are single-topic choices.

Since the data are in the form of a multidimensional contingency table, a discrete multivariate analysis was performed by constructing a log-linear model for the 2 X 2 X 4 frequency distribution corresponding to Table 5 (see Reynolds, 1977; Bishop, Fienberg, & Holland, 1975). The model included three factors, Surface Subject, First Topic, and Topic Choice, and was fitted to the 2 X 2 X 4 table and the significance of the individual main effect and interaction terms evaluated at the .05 level. There was a strong main effect of Topic Choice, meaning that

Table 5

Distribution of Topic Choices

	Choice			
Condition	A	B	Both A & B	Other
A-subject				
A-first	.46	.18	.25	.11
B-first	.23	.43	.28	.06
B-subject				
A-first	.33	.32	.24	.11
B-first	.24	.38	.29	.09

responses were unequally distributed into the four choice categories, and a significant interaction effect between First Topic and Topic Choice, meaning that the response distribution depended on which topic was mentioned first. However, there was no significant interaction effect between Surface Subject and Topic Choice, meaning that the responses were not influenced by which topic appeared as surface subject of the linking sentence. However, the model with all two-factor interactions produced a significantly poor fit ($.05<p<.02$) meaning that the apparent three-way interaction appearing in Table 5 is reliable; the effect of First Topic on Topic Choice depends on the Surface Subject factor.

Hence, topic A was chosen more often in the A-first order than in the B-first orders, and Topic B was chosen more often in the B-first order than in the A-first order. However, the stronger form of initial mention effect did not appear, in which the first-mentioned topic would be always prefered to the second-mentioned. Rather, the effect is asymetrical, due to a preference for topic A.

The surface subject manipulation appeared to be ineffective, but did interact with which topic appeared first in influencing the choices. But this interaction is rather hard to interpret. In the A-subject passages, there is a clear reversal of topic choice depending on the topic order. However, in the B-subject passages, the corresponding pattern does not appear. Rather, there is no overall topic preference in the A-first order, but B is preferred in the B-first order. At first glance, this pattern of results is consistent with the B-subject condition increasing the salience of topic B so that it competed evenly with A in the A-first order. The problem is that if the surface subject manipulation was affecting both topics equally, then one of the orders in the A-subject condition should also show no overall preference for one of the topics; this does not happen, as shown by the significant three-factor interaction in the log-linear analysis. A possible explanation is that if the two topics differed in overall preference due to conceptual salience, the surface-subject manipulation may have affected them unequally.

Although the asymmetrical effect qualifies the conclusion that initial mention influences main item choice, it argues quite effectively that subjects were not simply taking the "easy way out" by picking the

first item; for the asymmetric effect to appear, they had to be considering the content of the passage as a whole, and honestly considering the first- or second-mentioned candidate topic as their choice.

EXPERIMENT 5

This experiment attempted to bring the topic bias effects under control, both by classifying the topic pairs for salience differences on an a priori basis, and by more careful construction of the linking sentences. Due to the large number of two-topic responses in Experiment 4, a forced-choice procedure was used to obtain unambiguous choices of the more topical of the two candidate topics.

Method

Materials. Passages from Experiment 4 were selected, classified, and modified in an attempt to control the apparent salience of the two candidate topics. For this purpose, salience was loosely defined in terms of "superordination." That is, upon careful consideration of the content of the passages, some topics seemed to dominate their partners. For example, the topic pair Computers and Memory Systems seemed to have an unalterable part-whole relationship. Another passage about Sea Urchins and Biocrystals contained detailed information about the sea urchin's life-cycle, and the fact that its skeleton was made up of biocrystals, which were discussed further. It seemed that while one could consider biocrystals as merely an elaborative detail about the structure and development of sea urchins, a reader would not consider the life-cycle of the sea urchin to be an illustrative example of biocrystals. Many of the passages thus had topic pairs such that one seemed to be an example of the other, a part of the other, an elaborative detail of the other, or a result of the other. Furthermore there seemed to be some correspondence between topic preference and this loose, but intuitively compelling superordination relationship. Which of the two topics was superordinate to the other was judged intuitively on an a priori basis. The initial judgement was made by one person who was responsible for composing or modifying the passages. The passage topics were then reclassified by consensus of four other people and the original composer.

Six of the passages were selected and modified, and an additional two composed, so that the two topics did not appear to have the built-in superordination relationship described above, but such a relationship could be contained in a linking sentence to superordinate either concept. These passages were thus expected to show little topic choice bias except for that produced by the linking sentence. Two different forms were prepared in which either topic A or topic B was the surface subject of the linking sentence, and thereby the superordinate topic. This involved little or no change in the semantic content of the linking sentence other than subject. Two additional forms were generated by placing either the topic A or the topic B sentences first, for a total of 4 versions of each of these eight balanced passages.

Some of the other passages from Experiment 4 contained topic pairs that appeared to have an unalterable superordination relationship. Six such biased passages were used, with an a priori judgement made concerning which of the two topics was the superordinate one.

A final subset of the passages appeared to have topics that were very nearly equal in status, neither being the superordinate of the other. The linking sentence, and the remainder of the passage, were modified so as to keep the two topics as coordinate as possible. An example of the linking sentence of such a passage is The Faulkner system is often compared with tillage. Four such neutral passages were prepared.

As before, all passages consisted of five sentences, two about the first candidate topic, followed by the linking sentence, then two about the second candidate topic. Each passage appeared in either a topic A first version, or a topic B first version. Each passage was written to occupy 12 80-character lines.

The materials for the experiment were generated by a computer program which printed out a questionaire for each subject. Each page of the questionaire contained three passages; below each appeared the instruction "Circle the best title" followed by the two candidate topics expressed as brief noun phrases.

Design. The experiment was both within-subjects and within-passages. Each subject saw one version of each of the 18 passages. Over the entire experiment, each passage appeared in each of

its versions equally often. The questionaire-generating program used a set of latin squares to ensure that each subject saw an equal number of passages in each version type, and that the assignment of passages to versions was balanced over the whole set of subjects. The order with which passages appeared in each questionaire was randomized and the order in which the two candidate topics appeared in the response section below each passage was separately randomized for each passage and each questionaire.

Subjects and Procedure. Ninety-six University of Arizona students of either sex from introductory psychology classes served as subjects in return for extra class credit. The subjects were run in groups ranging from one to 17 in size. The instructions asked the subjects to read each passage and the two suggested titles, and then to circle the best one. After reading the instructions on the cover page of the questionaire, the subjects worked through the questionaire at their own pace. About 20 minutes was required to complete the task.

Results

Although some subjects commented that some of the passages appeared to have two topics, there was little confusion about the task, and none expressed any dissatisfaction with the forced-choice response format. The number of choices of each candidate topic were counted, and the results tabulated by passage and passage version.

The a priori superordinate judgements corresponded fairly well with the topic choice biases for the individual passages. Of the biased passages, five of the six agreed with the judged superordinate. Of the neutrals, the biases were slight, being within the .56-.44 range for all but one of the neutral passages. The one exception showed a rather strong bias, but there had been much dissension concerning its classification

The balanced passages were less consistent than hoped for, but still displayed a satisfactory control of bias effects. For four of the passages, both topics, when superordinated, were prefered. For three of the remaining four, one of the topics was preferred when made superordinate, but not the other. Only one passage failed to show at least one intended superordinate topic being preferred. However, as will be shown below, the degree of control was good enough to permit an

Table 6

Overall Choice Distribution

	Choice	
Passage Type	A	B
A-first	.72	.28
B-first	.41	.59
Overall	.57	.43

initial mention effect to show strongly.

As shown in Table 6, an overall preference for topic A similar to the earlier preference bias was observed. Across all passage versions, 57% of the responses were topic A choices. Similarly, an asymmetric effect of initial position also appeared. Topic A was chosen more often if it appeared first, and likewise for topic B. A chi-square test for homogeneity of the choice distribution produced by the A-first and the B-first conditions yielded a value of 170.74, $p<.001$. But the effect is not symmetric, due to the overall preference for topic A. However, if one simply tallies the number of passages presented in which A was the superordinate, a similar figure of 60% is obtained. Hence, the choice bias in favor of topic A is of a degree very similar to the controlled proportion of passages in which A was superordinate to B.

When the responses are considered on the basis of the controlled superordination, the initial mention effect can be seen independently of the topic bias problem. Table 7 shows the response distribution for the balanced passages, classified by which topic was superordinate, and also shown collapsed across intended superordinates.

A log-linear analysis was conducted on the balanced passage choice data, with three factors, Superordinate Topic, First Topic, and Topic Choice, using the 2 X 2 X 2 frequency distribution corresponding to Table 7. The analysis showed no main effect of choice category, and strongly significant ($p<.001$) interaction effects between Supordinate Topic and Topic Choice and between First Topic and Topic Choice. The model parameters indicated that the superordinate topic was chosen more often, and the first-mentioned topic was also chosen more often. The three-factor interation was not needed to fit the data; the model with all two-factor interaction terms fit well ($.5>p>.2$). Hence, the overall distribution of topic choices was uniform, unlike Experiment 4, and the topic choice depended both on which topic was superordinate and which was mentioned first, but these two factors did not interact with each other in determining the choice.

Thus, each topic is chosen more often when it appears first than when it appears second, although there is an overall bias in favor of topic A when it is superordinate, and in favor of topic B when it is superordinate. As shown by the overall portion of the table, and the

Table 7

Choice Distribution for

Balanced Passages

	Choice	
Passage Type	A	B
A-superordinate		
A-first	.72	.28
B-first	.47	.53
	.59	.41
B-superordinate		
A-first	.62	.38
B-first	.29	.71
	.46	.54
Overall		
A-first	.67	.33
B-first	.38	.62
	.52	.48

lack of a three-factor interaction in the analysis, when A and B are superordinate equally often, the effect of initial mention is symmetrical. Furthermore, unlike the results of Experiment 4, for both topics it holds that the first-presented topic is chosen more often than the second-presented.

Table 8 shows the response distribution for the biased passages. A log-linear analysis similar to that described above was performed, and again showed strongly significant effects ($p<.001$). There was a main effect of choice category, and interaction effects between Superordinate and Topic Choice and between First Topic and Topic Choice. Thus, for the four passages in which A was judged superordinate, there is a strong bias in favor of A. For the two B-superordinate passages, there is also a bias in favor of B, though not as strong. Consequently, the overall table for all six passages shows a bias in favor of topic A. However, notice that in all three portions of the table, there is an initial mention effect, in which the first-presented topic is chosen more often than if that same topic is presented second.

Finally, Table 9 shows the distribution of responses for the neutral passages. In this case, the dependence of the response choice on which topic was presented first can be assessed by the simple chi-square test for identical distributions in the A-first and the B-first conditions. This yielded a significant effect at $p<.001$. There is a slight bias in favor of topic A, but the initial mention effect approaches symmetry. Not only is each topic chosen more often if it appears first, but the first-presented topic is chosen more often than the second-appearing topic.

Discussion

This experiment succeded in bringing the salience differences between the two topics under control, both by more careful selection of topic pairs, and by classification of the biases in other passages. The influence of initial mention on main item choice then emerges unambiguously. Undoubtedly, the topic bias effects could be further studied, and this would reveal some interesting features of what is here loosely termed "superordination." However, detailed study of the topic choice effects in these two-topic passages would not in fact be a worthwhile effort because such passages are rather unrepresentative of actual prose. They were useful here to show how readers make use of

Table 8

Choice Distribution for

Biased Passages.

	Choice	
Passage Type	A	B
A-superordinate		
N=4		
A-first	.86	.14
B-first	.61	.39
	.74	.26
B-superordinate		
N=2		
A-first	.59	.41
B-first	.26	.74
	.43	.57
Overall		
N=6		
A-first	.77	.23
B-first	.49	.51
	.63	.37

Table 9

Choice Distribution for

Neutral Passages

	Choice	
Passage Type	A	B
A-first	.76	.24
B-first	.36	.64
Overall	.56	.44

initial mention as a cue to topicality, but they are of little interest otherwise.

The most remarkable feature of these results, however, is that readers are indeed making use of some relatively subtle semantic properties of the passages in arriving at their choices. In fact, each topic normally attracted about a third of the responses on its own merits, regardless of which topic was signalled by initial mention. This is remarkable because of the relative lack of background knowledge these subjects had of the material in the passages, which was of the level of Scientific American passages. All these considerations are but another reflection of the point made earlier, that subjects will take many passage features into account in the macro-level process of identifying a theme. The surface-level signals such as initial mention or topic-comment assignment may influence the process, but not dominate it. As one unusually insightful subject pointed out during her debriefing, of course the topic should be first, and usually was, but in some of the passages, the obvious topic was elsewhere!

GENERAL DISCUSSION

The idea that there is a linguistic convention requiring that the theme be initially stated was supported in a naturalistic manner by the first two studies which showed that natural passages often follow this rule. The third, fourth, and fifth studies showed that this convention is strong enough that initial position per se influences the perceived main idea and main item of a passage.

There is an easy criticism of these results: Subjects could simply be "copping out" by picking something from the first-presented sentence as a main idea or main item, either because this is the easiest way to do the task, or because they think that this is what they are supposed to do, based on their educational training. Hence, they are not figuring out what they "really" think is the "real" main idea or item. There are several responses to this criticism that dictate its dismissal: (1) Even if subjects were "copping out", the fact that they think the initially-appearing information is important in supplying a main idea or main item statement actually proves the point. (2) In these experiments, and as measured in Experiment 3, subjects took a long time, about a minute, to read and prepare a response to a fairly short passage; this amount of effort is inconsistent with a "cop-out"

strategy. (3) The subjects took other factors besides initial mention into account very strongly, and often picked non-initial information to use in their responses. Hence they seem to be seriously trying to find and state what they think is the actual main idea, and not simply picking an easy response. (4) In current theories of comprehension, the first information in a passage plays an important role. From this it can be argued that the reported effects are plausible enough and consistent enough with current theory that we need not attempt to reduce them to alternative explanations. Thus, these results can be accepted as demonstrating that since readers expect the thematic information in a passage to appear first, the first appearing information will tend to be viewed as thematic.

Reference Notes

1. Kieras, D. The relation of topics and themes in naturally occurring technical paragraphs. Technical Report, University of Arizona, January, 1979.

References

Bishop, Y. M. M., Fienberg, S. E., & Holland, P. W. Discrete multivariate analysis: Theory and practice. Cambridge, Mass.: The MIT Press, 1975.

Bransford, J. D., & Johnson, M. K. Contextual prerequisites for understanding: Some investigations of comprehension and recall. Journal of Verbal Learning and Verbal Behavior, 1972, 11, 717-726.

Carpenter, P. A., & Just, M. A. Integrative processes in comprehension. In D. LaBerge & S. J. Samuels (Eds.), Basic processes in reading: Perception and Comprehension. Hillsdale, N. J.: Lawrence Erlbaum Associates, 1977, 217-241.

Clark, H. H., & Haviland, S. E. Comprehension and the given-new contract. In R. O. Freedle (Ed.) Discourse processes: Advances in research and theory, Vol. 1. Norwood, New Jersey: Ablex Publishing Corporation, 1977.

Clements, P. The effects of staging on recall from prose. In R. O. Freedle (Ed.), New directions in discourse processing. Norwood, New Jersey: Ablex Publishing Corporation, 1979.

Deese, J., & Kaufman, R. A. Serial effects in recall of unorganized and sequentially organized verbal material. Journal of Experimental Psychology, 1957, 54, 180-187.

de Villiers, P. A. Imagery and theme in recall of connected discourse. Journal of Experimental Psychology, 1974, 103, 263-268.

Frase, L. T. Paragraph organization of written materials: The influence of conceptual clustering upon the level and organization of recall. Journal of Educational Psychology, 1969, 60, 394-401.

Johnson, R. E. Recall of prose as a function of the structural importance of the linguistic units. Journal of Verbal Learning and Verbal Behavior, 1970, 9, 12-20

Kieras, D. E. Good and bad structure in simple paragraphs: Effects on apparent theme, reading time, and recall. Journal of Verbal Learning and Verbal Behavior, 1978, 17, 13-28.

Kieras, D. E. Doing it the vendor's way: Running multiple subjects in reading experiments using Data General's Diskette Operating System. Behavior Research Methods and Instrumentation, 1979, 11, 221-224.

Kintsch, W., Kozminsky, E., Streby, W. J., McKoon, G., & Keenan, J. M. Comprehension and recall of text as a function of a content variable. Journal of Verbal Learning and Verbal Behavior, 1975, 14, 196-214.

Kintsch, W., & van Dijk, T. A. Toward a model of discourse

comprehension and production. Psychological Review, 1978, 85, 363-394.
Meyer, B. J. F. What is remembered from prose: A function of passage structure. In R. O. Freedle (Ed.), Discourse production and comprehension: Advances in research and theory, Vol. 1. Norwood, N. J.: Ablex Publishing Corporation, 1977.
Meyer, B. J. F., & McConkie, G. W. What is recalled after hearing a passage? Jounrnal of Educational Psychology, 1973, 65, 109-117.
Perfetti, C. A., & Goldman, S. R. Thematization and sentence retrieval. Journal of Verbal Learning and Verbal Behavior, 1974, 13, 70-79.
Perfetti, C. A., & Goldman, S. R. Discourse functions of thematization and topicalization. Journal of Psycholinguistic Research, 1975, 4, 257-271.
Reynolds, H. T. The analysis of cross-classifications. New York: The Free Press, 1977.
Sticht, T. G. Comprehending reading at work. In M. Just & P. Carpenter (Eds.) Cognitive processes in comprehension. Hillsdale, N. J.: Lawrence Erlbaum Associates, 1977.
Thorndyke, P. W. Cognitive structures in comprehension and memory of narrative discourse. Cognitive Psychology, 1977, 9, 77-110.
Thorndyke, P. W. Knowledge acquisition from newspaper stories. Discourse Processes, 1979, 2, 95-112.
van Dijk, T. A. Text and context. London: Longman, 1977. (a)
van Dijk, T. A. Semantic macro-structures and knowledge frames in discourse comprehension. In M. Just & P. Carpenter (Eds), Cognitive processes in comprehension. Hillsdale, N. J.: Lawrence Erlbaum Associates, 1977. (b)
van Dijk, T. A. Relevance assignment in discourse comprehension. Discourse Processes, 1979, 2, 113-126.

Navy

1 Dr. Ed Aiken
Navy Personnel R&D Center
San Diego, CA 92152

1 Dr. Robert Breaux
Code N-71
NAVTRAEQUIPCEN
Orlando, FL 32813

1 MR. MAURICE CALLAHAN
Pers 23a
Bureau of Naval Personnel
Washington, DC 20370

1 Dr. Richard Elster
Department of Administrative Sciences
Naval Postgraduate School
Monterey, CA 93940

1 DR. PAT FEDERICO
NAVY PERSONNEL R&D CENTER
SAN DIEGO, CA 92152

1 CDR John Ferguson, MSC, USN
Naval Medical R&D Command (Code 44)
National Naval Medical Center
Bethesda, MD 20014

1 Dr. John Ford
Navy Personnel R&D Center
San Diego, CA 92152

1 LT Steven D. Harris, MSC, USN
Code 6021
Naval Air Development Center
Warminster, Pennsylvania 18974

1 Dr. Norman J. Kerr
Chief of Naval Technical Training
Naval Air Station Memphis (75)
Millington, TN 38054

1 CHAIRMAN, LEADERSHIP & LAW DEPT.
DIV. OF PROFESSIONAL DEVELOPMMENT
U.S. NAVAL ACADEMYY
ANNAPOLIS, MD 21402

Navy

1 Dr. William L. Maloy
Principal Civilian Advisor for
Education and Training
Naval Training Command, Code 00A
Pensacola, FL 32508

1 CAPT Richard L. Martin
USS Francis Marion (LPA-Z49)
FPO New York, NY 09501

2 Dr. James McGrath
Navy Personnel R&D Center
Code 306
San Diego, CA 92152

1 DR. WILLIAM MONTAGUE
LRDC
UNIVERSITY OF PITTSBURGH
3939 O'HARA STREET
PITTSBURGH, PA 15213

1 Naval Medical R&D Command
Code 44
National Naval Medical Center
Bethesda, MD 20014

1 Library
Navy Personnel R&D Center
San Diego, CA 92152

6 Commanding Officer
Naval Research Laboratory
Code 2627
Washington, DC 20390

1 JOHN OLSEN
CHIEF OF NAVAL EDUCATION &
TRAINING SUPPORT
PENSACOLA, FL 32509

1 Psychologist
ONR Branch Office
495 Summer Street
Boston, MA 02210

1 Psychologist
ONR Branch Office
536 S. Clark Street
Chicago, IL 60605

Navy

1 Office of Naval Research
Code 200
Arlington, VA 22217

1 Office of Naval Research
Code 437
800 N. Quincy SStreet
Arlington, VA 22217

5 Personnel & Training Research Programs
(Code 458)
Office of Naval Research
Arlington, VA 22217

1 Psychologist
OFFICE OF NAVAL RESEARCH BRANCH
223 OLD MARYLEBONE ROAD
LONDON, NW, 15TH ENGLAND

1 Psychologist
ONR Branch Office
1030 East Green Street
Pasadena, CA 91101

1 Scientific Director
Office of Naval Research
Scientific Liaison Group/Tokyo
American Embassy
APO San Francisco, CA 96503

1 Office of the Chief of Naval Operations
Research, Development, and Studies Branc
(OP-102)
Washington, DC 20350

1 Scientific Advisor to the Chief of
Naval Personnel (Pers-Or)
Naval Bureau of Personnel
Room 4410, Arlington Annex
Washington, DC 20370

1 LT Frank C. Petho, MSC, USNR (Ph.D)
Code L51
Naval Aerospace Medical Research Laborat
Pensacola, FL 32508

Navy

1 DR. RICHARD A. POLLAK
ACADEMIC COMPUTING CENTER
U.S. NAVAL ACADEMY
ANNAPOLIS, MD 21402

1 Roger W. Remington, Ph.D
Code L52
NAMRL
Pensacola, FL 32508

1 Mr. Arnold Rubenstein
Naval Personnel Support Technology
Naval Material Command (08T244)
Room 1044, Crystal Plaza #5
2221 Jefferson Davis Highway
Arlington, VA 20360

1 Dr. Worth Scanland
Chief of Naval Education and Training
Code N-5
NAS, Pensacola, FL 32508

1 A. A. SJOHOLM
TECH. SUPPORT, CODE 201
NAVY PERSONNEL R& D CENTER
SAN DIEGO, CA 92152

1 Mr. Robert Smith
Office of Chief of Naval Operations
OP-987E
Washington, DC 20350

1 Dr. Alfred F. Smode
Training Analysis & Evaluation Group
(TAEG)
Dept. of the Navy
Orlando, FL 32813

1 Dr. Richard Sorensen
Navy Personnel R&D Center
San Diego, CA 92152

1 CDR Charles J. Theisen, JR. MSC, USN
Head Human Factors Engineering Div.
Naval Air Development Center
Warminster, PA 18974

Navy

1 W. Gary Thomson
Naval Ocean Systems Center
Code 7132
San Diego, CA 92152

Army

1 Technical Director
U. S. Army Research Institute for the Behavioral and Social Sciences
5001 Eisenhower Avenue
Alexandria, VA 22333

1 HQ USAREUE & 7th Army
ODCSOPS
USAAREUE Director of GED
APO New York 09403

1 LCOL Gary Bloedorn
Training Effectiveness Analysis Division
US Army TRADOC Systems Analysis Activity
White Sands Missile Range, NM 88002

1 DR. RALPH DUSEK
U.S. ARMY RESEARCH INSTITUTE
5001 EISENHOWER AVENUE
ALEXANDRIA, VA 22333

1 Dr. Ed Johnson
Army Research Institute
5001 Eisenhower Blvd.
Alexandria, VA 22333

1 Dr. Michael Kaplan
U.S. ARMY RESEARCH INSTITUTE
5001 EISENHOWER AVENUE
ALEXANDRIA, VA 22333

1 Dr. Milton S. Katz
Individual Training & Skill
Evaluation Technical Area
U.S. Army Research Institute
5001 Eisenhower Avenue
Alexandria, VA 22333

1 Dr. Beatrice J. Farr
Army Research Institute (PERI-OK)
5001 Eisenhower Avenue
Alexandria, VA 22333

1 Dr. Harold F. O'Neil, Jr.
ATTN: PERI-OK
5001 EISENHOWER AVENUE
ALEXANDRIA, VA 22333

Army

1 Dr. Robert Sasmor
U. S. Army Research Institute for the Behavioral and Social Sciences
5001 Eisenhower Avenue
Alexandria, VA 22333

1 Director, Training Development
U.S. Army Administration Center
ATTN: Dr. Sherrill
Ft. Benjamin Harrison, IN 46218

1 Dr. Joseph Ward
U.S. Army Research Institute
5001 Eisenhower Avenue
Alexandria, VA 22333

Air Force

1 DR. G. A. ECKSTRAND
AFHRL/AS
WRIGHT-PATTERSON AFB, OH 45433

1 Dr. Genevieve Haddad
Program Manager
Life Sciences Directorate
AFOSR
Bolling AFB, DC 20332

1 CDR. MERCER
CNET LIAISON OFFICER
AFHRL/FLYING TRAINING DIV.
WILLIAMS AFB, AZ 85224

1 Research Branch
AFMPC/DPMYP
Randolph AFB, TX 78148

1 Dr. Marty Rockway (AFHRL/TT)
Lowry AFB
Colorado 80230

1 Jack A. Thorpe, Capt, USAF
Program Manager
Life Sciences Directorate
AFOSR
Bolling AFB, DC 20332

1 Brian K. Waters, LCOL, USAF
Air University
Maxwell AFB
Montgomery, AL 36112

Marines

1 H. William Greenup
Education Advisor (E031)
Education Center, MCDEC
Quantico, VA 22134

1 Director, Office of Manpower Utilization
HQ, Marine Corps (MPU)
BCB, Bldg. 2009
Quantico, VA 22134

1 DR. A.L. SLAFKOSKY
SCIENTIFIC ADVISOR (CODE RD-1)
HQ, U.S. MARINE CORPS
WASHINGTON, DC 20380

CoastGuard

1 Mr. Richard Lanterman
PSYCHOLOGICAL RESEARCH (G-P-1/62)
U.S. COAST GUARD HQ
WASHINGTON, DC 20590

Other DoD

1 Dr. Stephen Andriole
ADVANCED RESEARCH PROJECTS AGENCY
1400 WILSON BLVD.
ARLINGTON, VA 22209

12 Defense Documentation Center
Cameron Station, Bldg. 5
Alexandria, VA 22314
Attn: TC

1 Dr. Dexter Fletcher
ADVANCED RESEARCH PROJECTS AGENCY
1400 WILSON BLVD.
ARLINGTON, VA 22209

1 Military Assistant for Training and
Personnel Technology
Office of the Under Secretary of Defense
for Research & Engineering
Room 3D129, The Pentagon
Washington, DC 20301

Civil Govt

1 Dr. Susan Chipman
Basic Skills Program
National Institute of Education
1200 19th Street NW
Washington, DC 20208

1 Dr. Richards J. Heuer
ORPA/AMERS
Washington, DC 20505

1 Dr. Joseph I. Lipson
Division of Science Education
Room W-638
National Science Foundation
Washington, DC 20550

1 Dr. Joseph Markowitz
Office of Research and Development
Central Intelligence Agency
Washington, DC 20205

1 Dr. John Mays
National Institute of Education
1200 19th Street NW
Washington, DC 20208

1 William J. McLaurin
Rm. 301, Internal Revenue Service
2221 Jefferson Davis Highway
Arlington, VA 22202

1 Dr. Arthur Melmed
National Intitute of Education
1200 19th Street NW
Washington, DC 20208

1 Dr. Andrew R. Molnar
Science Education Dev.
and Research
National Science Foundation
Washington, DC 20550

1 Dr. Jeffrey Schiller
National Institute of Education
1200 19th St. NW
Washington, DC 20208

Civil Govt

1 Dr. H. Wallace Sinaiko
Program Director
Manpower Research and Advisory Services
Smithsonian Institution
801 North Pitt Street
Alexandria, VA 22314

1 Dr. Thomas G. Sticht
Basic Skills Program
National Institute of Education
1200 19th Street NW
Washington, DC 20208

1 Dr. Frank Withrow
U. S. Office of Education
400 6th Street SW
Washington, DC 20202

1 Dr. Joseph L. Young, Director
Memory & Cognitive Processes
National Science Foundation
Washington, DC 20550

Non Govt

1 Dr. Earl A. Alluisi
HQ, AFHRL (AFSC)
Brooks AFB, TX 78235

1 Dr. John R. Anderson
Department of Psychology
Carnegie Mellon University
Pittsburgh, PA 15213

1 DR. MICHAEL ATWOOD
SCIENCE APPLICATIONS INSTITUTE
40 DENVER TECH. CENTER WEST
7935 E. PRENTICE AVENUE
ENGLEWOOD, CO 80110

1 1 psychological research unit
Dept. of Defense (Army Office)
Campbell Park Offices
Canberra ACT 2600, Australia

1 Dr. Alan Baddeley
Medical Research Council
Applied Psychology Unit
15 Chaucer Road
Cambridge CB2 2EF
ENGLAND

1 Dr. Patricia Baggett
Department of Psychology
University of Denver
University Park
Denver, CO 80208

1 Mr Avron Barr
Department of Computer Science
Stanford University
Stanford, CA 94305

1 Dr. Nicholas A. Bond
Dept. of Psychology
Sacramento State College
600 Jay Street
Sacramento, CA 95819

1 Dr. Lyle Bourne
Department of Psychology
University of Colorado
Boulder, CO 80302

Non Govt

1 Dr. Kenneth Bowles
Institute for Information Sciences
University of California at San Diego
La Jolla, CA 92037

1 Dr. John S. Brown
XEROX Palo Alto Research Center
3333 Coyote Road
Palo Alto, CA 94304

1 Dr. Bruce Buchanan
Department of Computer Science
Stanford University
Stanford, CA 94305

1 DR. C. VICTOR BUNDERSON
WICAT INC.
UNIVERSITY PLAZA, SUITE 10
1160 SO. STATE ST.
OREM, UT 84057

1 Dr. John B. Carroll
Psychometric Lab
Univ. of No. Carolina
Davie Hall 013A
Chapel Hill, NC 27514

1 Charles Myers Library
Livingstone House
Livingstone Road
Stratford
London E15 2LJ
ENGLAND

1 Dr. William Chase
Department of Psychology
Carnegie Mellon University
Pittsburgh, PA 15213

1 Dr. Micheline Chi
Learning R & D Center
University of Pittsburgh
3939 O'Hara Street
Pittsburgh, PA 15213

1 Dr. William Clancey
Department of Computer Science
Stanford University
Stanford, CA 94305

Non Govt

1 Dr. Allan M. Collins
Bolt Beranek & Newman, Inc.
50 Moulton Street
Cambridge, Ma 02138

1 Dr. Meredith Crawford
Department of Engineering Administration
George Washington University
Suite 805
2101 L Street N. W.
Washington, DC 20037

1 Dr. Ruth Day
Center for Advanced Study
in Behavioral Sciences
202 Junipero Serra Blvd.
Stanford, CA 94305

1 Dr. Hubert Dreyfus
Department of Philosophy
University of California
Berkely, CA 94720

1 MAJOR I. N. EVONIC
CANADIAN FORCES PERS. APPLIED RESEARCH
1107 AVENUE ROAD
TORONTO, ONTARIO, CANADA

1 Dr. Ed Feigenbaum
Department of Computer Science
Stanford University
Stanford, CA 94305

1 Mr. Wallace Feurzeig
Bolt Beranek & Newman, Inc.
50 Moulton St.
Cambridge, MA 02138

1 Dr. Victor Fields
Dept. of Psychology
Montgomery College
Rockville, MD 20850

1 Dr. Edwin A. Fleishman
Advanced Research Resources Organ.
Suite 900
4330 East West Highway
Washington, DC 20014

Non Govt

1 Dr. John R. Frederiksen
Bolt Beranek & Newman
50 Moulton Street
Cambridge, MA 02138

1 Dr. Alinda Friedman
Department of Psychology
University of Alberta
Edmonton, Alberta
CANADA T6G 2J9

1 Dr. Vernon S. Gerlach
College of Education
146 Payne Bldg. B
Arizona State University
Tempe, AZ 85281

1 DR. ROBERT GLASER
LRDC
UNIVERSITY OF PITTSBURGH
3939 O'HARA STREET
PITTSBURGH, PA 15213

1 Dr. Ira Goldstein
XEROX Palo Alto Research Center
3333 Coyote Road
Palo Alto, CA 94304

1 DR. JAMES G. GREENO
LRDC
UNIVERSITY OF PITTSBURGH
3939 O'HARA STREET
PITTSBURGH, PA 15213

1 Dr. Ron Hambleton
School of Education
University of Massechusetts
Amherst, MA 01002

1 Dr. Barbara Hayes-Roth
The Rand Corporation
1700 Main Street
Santa Monica, CA 90406

1 Dr. Frederick Hayes-Roth
The Rand Corporation
1700 Main Street
Santa Monica, CA 90406

Non Govt

1 Library
HumRRO/Western Division
27857 Berwick Drive
Carmel, CA 93921

1 Dr. Earl Hunt
Dept. of Psychology
University of Washington
Seattle, WA 98105

1 DR. LAWRENCE B. JOHNSON
LAWRENCE JOHNSON & ASSOC., INC.
SUITE 502
2001 S STREET NW
WASHINGTON, DC 20009

1 Dr. Arnold F. Kanarick
Honeywell, Inc.
2600 Ridgeway Pkwy
Minneapolis, MN 55413

1 Dr. Walter Kintsch
Department of Psychology
University of Colorado
Boulder, CO 80302

1 Dr. Stephen Kosslyn
Harvard University
Department of Psychology
33 Kirkland Street
Cambridge, MA 02138

1 Mr. Marlin Kroger
1117 Via Goleta
Palos Verdes Estates, CA 90274

1 LCOL. C.R.J. LAFLEUR
PERSONNEL APPLIED RESEARCH
NATIONAL DEFENSE HQS
101 COLONEL BY DRIVE
OTTAWA, CANADA K1A 0K2

1 Dr. Jill Larkin
Department of Psychology
Carnegie Mellon University
Pittsburgh, PA 15213

Non Govt

1 Dr. Alan Lesgold
Learning R&D Center
University of Pittsburgh
Pittsburgh, PA 15260

1 Dr. Robert A. Levit
Manager, Behavioral Sciences
The BDM Corporation
7915 Jones Branch Drive
McClean, VA 22101

1 Dr. Robert Linn
College of Education
University of Illinois
Urbana, IL 61801

1 Dr. Mark Miller
Systems and Information Sciences Laborat
Central Research Laboratories
TEXAS INSTRUMENTS, INC.
Mail Station 5
Post Office Box 5936
Dallas, TX 75222

1 Dr. Richard B. Millward
Dept. of Psychology
Hunter Lab.
Brown University
Providence, RI 82912

1 Dr. Allen Munro
Univ. of So. California
Behavioral Technology Labs
3717 South Hope Street
Los Angeles, CA 90007

1 Dr. Donald A Norman
Dept. of Psychology C-009
Univ. of California, San Diego
La Jolla, CA 92093

1 Dr. Seymour A. Papert
Massachusetts Institute of Technology
Artificial Intelligence Lab
545 Technology Square
Cambridge, MA 02139

Non Govt

1 MR. LUIGI PETRULLO
2431 N. EDGEWOOD STREET
ARLINGTON, VA 22207

1 DR. PETER POLSON
DEPT. OF PSYCHOLOGY
UNIVERSITY OF COLORADO
BOULDER, CO 80302

1 DR. DIANE M. RAMSEY-KLEE
R-K RESEARCH & SYSTEM DESIGN
3947 RIDGEMONT DRIVE
MALIBU, CA 90265

1 Dr. Peter B. Read
Social Science Research Council
605 Third Avenue
New York, NY 10016

1 Dr. Fred Reif
SESAME
c/o Physics Department
University of California
Berkely, CA 94720

1 Dr. Andrew M. Rose
American Institutes for Research
1055 Thomas Jefferson St. NW
Washington, DC 20007

1 Dr. Ernst Z. Rothkopf
Bell Laboratories
600 Mountain Avenue
Murray Hill, NJ 07974

1 Dr. David Rumelhart
Center for Human Information Processing
Univ. of California, San Diego
La Jolla, CA 92093

1 PROF. FUMIKO SAMEJIMA
DEPT. OF PSYCHOLOGY
UNIVERSITY OF TENNESSEE
KNOXVILLE, TN 37916

1 DR. WALTER SCHNEIDER
DEPT. OF PSYCHOLOGY
UNIVERSITY OF ILLINOIS
CHAMPAIGN, IL 61820

Non Govt

1 Dr. Allen Schoenfeld
Department of Mathematics
Hamilton College
Clinton, NY 13323

1 Dr. Robert Smith
Department of Computer Science
Rutgers University
New Brunswick, NJ 08903

1 Dr. Richard Snow
School of Education
Stanford University
Stanford, CA 94305

1 Dr. Robert Sternberg
Dept. of Psychology
Yale University
Box 11A, Yale Station
New Haven, CT 06520

1 DR. ALBERT STEVENS
BOLT BERANEK & NEWMAN, INC.
50 MOULTON STREET
CAMBRIDGE, MA 02138

1 DR. PATRICK SUPPES
INSTITUTE FOR MATHEMATICAL STUDIES IN THE SOCIAL SCIENCES
STANFORD UNIVERSITY
STANFORD, CA 94305

1 Dr. Kikumi Tatsuoka
Computer Based Education Research Laboratory
252 Engineering Research Laboratory
University of Illinois
Urbana, IL 61801

1 Dr. Maurice Tatsuoka
Department of Educational Psychology
University of Illinois
Champaign, IL 61801

1 Dr. John Thomas
IBM Thomas J. Watson Research Center
P.O. Box 218
Yorktown Heights, NY 10598

Non Govt

1 DR. PERRY THORNDYKE
THE RAND CORPORATION
1700 MAIN STREET
SANTA MONICA, CA 90406

1 Dr. Douglas Towne
Univ. of So. California
Behavioral Technology Labs
3717 South Hope Street
Los Angeles, CA 90007

1 Dr. J. Uhlaner
Perceptronics, Inc.
6271 Variel Avenue
Woodland Hills, CA 91364

1 Dr. Benton J. Underwood
Dept. of Psychology
Northwestern University
Evanston, IL 60201

1 Dr. Phyllis Weaver
Graduate School of Education
Harvard University
200 Larsen Hall, Appian Way
Cambridge, MA 02138

1 Dr. David J. Weiss
N660 Elliott Hall
University of Minnesota
75 E. River Road
Minneapolis, MN 55455

1 DR. SUSAN E. WHITELY
PSYCHOLOGY DEPARTMENT
UNIVERSITY OF KANSAS
LAWRENCE, KANSAS 66044

1 Dr. Karl Zinn
Center for research on Learning and Teaching
University of Michigan
Ann Arbor, MI 48104