Linguistic research at phonological and higher levels is reviewed. At the phonological level controversy centers around the phenomena of linguistic development, including reading, spelling, and pronounceability, and is accompanied by suggestions of how to help a learner cope with these phenomena. At the higher levels of apparent and underlying phrase structure and the semantic structure which goes with them, controversy occurs in such areas as grammaticality and dialectical differences. Implications of the research are that reading teachers must understand a complex set of linguistic principles, must be able to recognize those instances in which each principle is applicable, and must be able to apply appropriate instructional procedures in proper instances. A bibliography is included. (MD)

Aaron S. Carton, Associate Professor
Department of Education
State University of New York at Stony Brook

PAPER READ AT THE 1968 MEETINGS AT THE INTERNATION READING ASSOCIATION

SYMPOSIUM I   EXTENDING FRONTIERS OF RESEARCH

Linguistics and Reading Instruction

Research Issues: 1968

During the last three years (1964-1967) Project Literacy

Reports provided an excellent setting for the informal presentation

of theorization and empirical research on linguistics and reading.

Some dramatic encounters between points of view in linguistics

itself were manifested in these Reports and there occurred some

surprising expansions in what, a few years ago, seemed to be the

only logical implications of linguistics for reading.

This review will be confined to tracing the issues which

have emerged in recent years and which are now in the process of

resolution.   It is organized around two echelons of language:

(a) the phonological level and (b) the "higher levels." But,

first, let us look at the partnership that generates the research

that concerns us.

Distinctions and a Partnership.

The philosophic formulation of a theory of signs distinguishes among (a) the study of the relation of signs to the users of signs (b) the study of the relation of signs to their referents and (c) the study of signs themselves and the relations among them (9,27). The three domains are inter-related and inter-dependent. The distinctions are important, however, to help keep in mind the difference, for example, between the systematic analysis of language (linguistics) and the psychological problems of learning a language or of learning how to read.

The demarcation of the three levels of discourse seems to form natural boundaries among the academic disciplines that are concerned with symbolic behavior, psychology or psycholinguistics, semantics, and linguistics. Separated disciplines, however, do not always develop coordinated theories and compatible methods, especially, perhaps, when the disciplines are themselves subject to theoretical tensions.

On the other hand some early efforts to establish a discipline of "psycholinguistics" were peaceful and productive (28). More recently, language has become a testing ground for the implications of various theoretical positions in psychology (3,6) while attempts to clarify certain issues in linguistics have occurred in the context of psychological experiments(26). In addition, a very

vigorous line of investigation of childhood language acquisition plays a catalytic role.

Educational problems, such as reading, have no regard for the boundaries among formal academic disciplines and they stimulate a rapid shuttling between levels of discourse. As long as the necessary distinctions for defining sub-problems are kept clear, very exciting and productive research on linguistics and reading may be expected to occur in the context of today's disputes and tensions among psychologists and linguists of various persuasions.

It may be acknowledged that Bloomfield (5) may have ventured into education somewhat recklessly. But in attempting to order his materials from the simple to the complex, after he had arrayed them in the systematic manner suggested by his linguistic analysis, he did not deviate markedly from the educational and psychological dicta of his day. By the time his contributions were noticed by the reading field (8) his pedagogy seemed to have become obsolete.

Recently Venezky (29) conceived of reading as the translation of marks on paper to sounds as Bloomfield had. On the other hand, Venezkey suggested, however, that the "notion of sequencing materials from the simple to the complex, the heart of the Bloomfield approach and of almost all the 'linguistic' approaches...is a 'sacred cow' that could be re-examined." He argued, for example, that while the pronunciation of certain letters depended on their

graphemic environment (e.g. "a" in "man" and "mane") it was a matter of pedagogic choice as to whether the two phoneme-grapheme correspondences should be taught sequentially or simultaneously. Ample data from learning studies are available to support Venezky's conjecture that "the potential generalization derived from the differentiation approach...certainly is greater than from the simple sequence method."

Similarly, Gibson, Farber, and Shepela (13) raised the question as to whether certain systematic, high frequency spelling patterns, could be abstracted by kindergarteners and first-graders using a "learning set" procedure. Drills with negative and positive instances of several patterns were presented so that the abstraction of the superordinate principle became possible, following principles Harlow (18) had developed working with monkeys many years earlier.

While only one in twelve participating kindergartners completed the experiment, three out of five of the first graders who did showed evidence of forming learning sets by solving at least 80 per cent of the problems at the end of the five-day study. The conclusion that these young pupils actively searched for an underlying pattern on principle, even if it was a wrong one, was substantiated by individual response patterns, by the remarks of the pupils, and by the fact that those who had not succeeded in abstracting the patterns scored consistently at less than chance levels.

The study suggests that in addition to understanding the linguistic phenomena involved in any problem in learning how to read, the educational process must be accompanied by an understanding of how the learner may cope with these phenomena. In the difference between kindergartners and first graders, the study reiterated the obvious and pervasive educational percept that coping abilities and strategies may be expected to follow developmental patterns. In this form the implication follows that concepts such as readiness should not be considered in general molar terms, such as "reading readiness," but can be broken down to more specific readinesses such as "readiness to establish learning sets," "readiness for phoneme or letter-sequences of X length," "readiness to handle disjunctive possibilities in the fact that the same letters may represent more than one sound," etc. (21). Data of this type, it may be argued, are relevant to determining how much of which method is appropriate at what point in the learning process. The value and function of partnership of linguistics, psycholinguistics, and reading pedagogy is illustrated by the studies cited.

Theory and Research on the Phonological Level

As far as the reading profession was concerned, (2) linguists had "demonstrated the primacy of speech" over writing. It had been noted that speech was historically earlier than writing and that writing, in its modern form, is essentially speech written down. In both the foreign language field and in reading, linguistics seemed to imply to many to be the proper sequencing of the development of communication skills for the modern literate human is a recapitulation of his historic development.

For linguistics, reading was thus the "decoding" of the phonetic values of the letters upon the page (8). Even Lefevre's "linguistic approach" (24) which considered the sentence as the basic unit of communication, emphasized sentence _intonation_, or what linguists call the "suprasegmentals," as thought reading were a process of making texts audible. The linguist, Charles Hockett, (19) concluded that the logical essential policy in literacy training was to "teach the correlations between graphic marks and linguistic units."

Since English spelling is such a graveyard of the history of the language, there is less than perfect certainty as to correlations between writing and speech sounds. The relative frequencies of the applicability and inapplicability of various types of correspondences between spelling and pronunciation

across large samples of text may be ascertained by means of

computers (31). Venezky's (29) classification scheme for the

study of phonome-to-grapheme correspondences consisted of the

following:

    a. Predictable correspondences including

        1. those which were invariant and

        2. those which vary according to statable rules

           together with

    b. Unpredictable correspondences including

        1. "affix aided" ones (or those that occur as

           a result of a morphological change e.g.

           sign $\rightarrow$ signal)

        2. high frequency unpredictable correspondences

           and

        3. low frequency ones.

On the instructional side, Williams (33) proposed the

"systematic investigation of...variables basic to the development

of effective instructional sequences." These included concern

for 'sounding out' grapheme combinations, phoneme blending,

phoneme differentiation, grapheme discrimination, associative

learning of individual graphemes and phonemes."

When, however, Venezky (29) attempted to test empirically the

degree to which the statistical properties of his sound-to-spelling

correspondences were relevant to the reading process, he encounter

some anomolies. His subjects were college sophomores, sixth-grade

and third-graders. His first hypothesis was that the frequency

of occurence of variant responses to unpredictable patterns would

correlate positively with the frequency of occurence of the

pronounciation of real English words. He made up "nonsense"

words containing some of the spellings in question and asked his

subjects to pronounce them. His hypothesis did not prove to hold

in all cases.

Second he hypothesized that pronunciations based on form

class would vary according to syntax in sentences but would vary

randomly out of text. Initial "th" is voiced in English only in

the case of noun markers and a few other function words (e.g. the,

there, that,) but voiceless as the initial consonants of "content"

words (think, thing, etc.). Venezky asked his subjects to pro-

nounce invented, or "nonsense" words containing "th" in initial

position which he presented both in list form and in the context

of sentences. Contrary to expectations, his subjects always

preferred the voiceless phoneme and they did so even in sentences

that were arranged so that the invented words seemed to be a

function words. Indeed stress patterns of sentences would be

awkwardly altered so that the invented word would appear to be a

content word.

Venezky tentatively concluded that spelling-to-sound habits

are strongly word oriented. It is as though "an alert were set

for members of a limited group of stimuli... When no limited group exists for a variant pattern, strategies based on word analogies are employed."

Much of Venezky's study suggested that additional factors other than invariant or variable letter-to-sound relationships effect the decoding of the printed page. The findings came as no surprise. Many experimenters in reading frequently cited Cattell's study of 1885 (7) which suggested that perception involved a grouping of stimulus elements which in the modern scientific vernacular they called "chunking." In the 1940's the psycho-logical experimentation in what was called the "new look in perception" (comprehensively reviewed by Allport (1) explored a myriad of factors accounting for variations in the boundaries and perceptibility of various kinds of "chunks."

Among the factors that were at one time or another identified in the perceptibility of sequences of letters was one called "pronounceability" in the recent reading research. But rather early in the history of American linguistics, Benjamin Lee Whorf pointed out that in each language there were certain phoneme strings that were more likely to occur than others and that in writing there was a parallel in respect to letter strings (32). When "nonsense words" or perhaps better, "pseudo words" are made up by the speaker of any language, they are not comprised of a random sample of all possible human speech sounds arranged in

random sequences but they are a set of phoneme strings that are very much a product of the language of their constructor. They are characterizable manifestations of the phonology of the constructor's language containing exclusively the speech sounds of his language. They are arranged or sequenced according to the constraints and probabilities of that language for sequencing its speech sounds. In short they are possible words of the constructor's language which do not happen to exist. (Brillig, slithey, and toves become words only when Humpty Dumpty gives them meaning).

In a study by Gibson, Schurcliff, and Yonas (14) glurck was an example of a pronounceable English pseudo-word but ckurgl-- which had to be constructed by special effort using systematic permutations--was an unpronounceable one. Pronounceability had been objectively arrived at and verified by counting the number of various pronounciations each word evoked from readers who were asked to say them; the greater the variety of pronounciations the less pronounceable. This measure correlated quite well with ratings of pronounceability, r=.83.

Gibson and her associates knew from many previous studies that when pronounceable pseudo-words are presented by means of a tachistoscope for intervals so brief that it was hard to recognize them, they are, nevertheless more easily recognized than words that are not pronounceable. It had indeed been shown in her laboratory that blind readers of braille had less trouble with

pronounceable pseudo-words than unpronounceable ones. But why was this true? What about pronounceability made the words easier to read? What materials could be identified as accounting for this phenomenon?

The point of the departure for the study by Gibson, Schurcliff, and Yonas was the notion that the "rules of spelling-to-word mapping suggested that mapping invariance creates larger units for reading and therefore faster processing." That is to say, the pronounceable chunks tend to occur with invariant spelling patterns. This was the very notion implied by Wier and Venezky when they added morphophonemic-spelling correspondences to their phoneme-grapheme ones in their statistical studies. But was it the "transitional probabilities"--the fact that certain two letter (bigram) and three letter (trigram) strings are more likely to occur than others--that accounted for the observed difference in the hitherto existing data as Anisfeld believed? Or was it because pronounceable words were better "matches" to acoustic representations held by the reader and as Levin and Beimiller believed, there was auditory encoding before final reading? Or, similarly, was it because "processing of letter-strings in reading involves encoding and matching to an articulatory representation or 'plan'" as implied by Liberman, and his associates in their "motor theory of speech perception?" Or, finally, was it because "complex morphological rules cover structural patterns of letters permissible in English words"? These imply a

"kind of syntax, analogous to grammar" for phoneme-strings and letter-strings very much like that formulated by Whorf many years earlier---and apparently unnoticed, or at least not cited, by the experimenters.

By comparing the effect of pronounceability on hearing and deaf-mute readers, Gibson and her colleagues attempted to discover whether the constructs of accoustic or articulatory representation were <u>necessary</u> to explain the differences between the readabilities of pronounceable and unpronounceable words. It turned out that pronounceability did indeed <u>facilitate</u> the reading of tachisto-scopically presented words for deaf-mute subjects, as it did for hearing ones.

Then do bigram and trigram frequencies which can be processed exclusively in the visual mode remain to account for the difference in readability? The answer was: <u>No</u>. Measurements of bigram and trigram frequencies in stimulus materials did not facilitate the readability of the materials for either deaf or hearing subjects and correlated negatively, if at all, with the measured pronounceability of the words.

The experiment may not be taken to prove, however, that articulatory or accoustic representation do not play <u>any</u> role in reading. Liberman's notion of articulatory representation in the hearing of speech was formulated in the context of a mass of electrographic and myographic data. Hardyck and Petronovich (17)

have, furthermore, collected convincing data indicating that
speech movements play at least a facilitative role for at least
some readers and for at least certain categories of text.

Since accoustic representation is, to date, not accessible
to any form of direct scientific obervation, the notion that we
hear what we read is appealing only on a private level rather
than on a scientific basis. It is credible primarily to those
of us who are sometimes told we are poor and slow readers and who
subjectively think we sometimes hear ourselves when we read or
write. Thus, since it was also true that in the experiment in
question the general performance of hearing subjects was superior
to deaf subjects in reading tachistoscopically presented pseudo-
words, it may be advisable to think of all the hypothesized
constructs, such as auditory and articulatory representation, as
comprising a multiplicity of facilitative processes rather than
as factors which are necessary and sufficient conditions, each
competing to account completely for the phenomena in question.

The results of the experiment implied to Gibson and her
associates that "pronounceability ratings...(measure) morphological
regularity (rules governing the internal structure of English
words) and that it is this kind of structure in pronounceable
words that facilitates perception." The relation between the
auditory properties of the words, that is, their pronounceability,
was traced back to the development of the writing system which
evolved in relation to sound. The experiment seemed to imply that

although "writing is a surrogate for speech... morphological rules are rules in their own right and apparently can be learned as such."

Two linguists of different theoretical persuasions provide background. Charles Hockett (20) argued on his part that since English written words are not a simple and direct representation of spoken words "...a kind of representation [is to be sought]... from which both the actual spelling of the written word and the actual pronounciation of the spoken word are completely predictable." The unit by which this "spelling" is to occur is the "morphon;" a kind of representational system or alphabet which is perhaps developed intuitively by every literate individual. Once explicitly identified, the "acquisition of literacy in English [would involve]... building-in of this additional implicit level of representation." A number of problems in this formulation have already been identified by Hockett as has research in developing specifications and statistical properties of the "morphons" by at least one of Hockett's students, Daniel Kimball.

Hockett also supplied perhaps the most lucid statement of the opposing position of Noam Chomsky. Chomsky sees the basic representational system to be the general grammar of English (rather than the specific set of morphons as mediators). In the output of sentences, this grammar may generate either written sentences or spoken ones." The written sentence need not be

interpreted as representing a spoken sentence......"

A close examination of Chomsky's view (10) reveals it to be
quite radical. First he "offered several arguments [throughout his
writings] in support of the conclusion that there is no linguistic
justification for a phonemic level. ...Phonemics... in the modern
sense, is perhaps nothing more than a methodological artifact."
Next Chomsky took the position that the representation of words
in a dictionary "provides a natural orthography for a person who
knows a language and that the relation between conventional
spelling and phonological representation is very close... Con-
ventional spelling is by and large a highly effective system for
a wide range of dialects because it corresponds to a common
underlying phonological representation relatively invariant among
dialects despite wide phonetic divergences."

For Chomsky, phoneme-grapheme or sound-letter correspondences
was a pseudo-issue even before research on it was begun. Hockett's
adduction of "morphons" seems to provide a compromise. It moves
away from the classical linguistic Bloomfieldian view of reading
to an alternative position not quite as radical as Chomsky's.

But Chomsky concludes that "sound-letter correspondence
need hardly be taught, particularly the most general and deepest
of these rules... [They are] part of the unconscious equipment
of the non-literate speaker. What [essentially must be learned] is

simply the elementary correspondence between the underlying phonological segments of his internalized lexicon and the orthographic system."

Although it is "not clear [to Hockett] how this approach might suggest pedagogical procedures other than those suggested by the classical (Bloomfieldian) view" it does seem to us from the nature of his arguments described above and theory and data developed by his adherents which are to be described in the following discussion that for Chomsky the implications of linguistics for reading come full-turn around to the methods of basal readers or "look-say," procedures.

He does so, however, with considerable and noteworthy circumspection. "Children," he notes "may well...hear phonetically [i.e. in terms of the minutest details of speech sounds] not phonologically." A child of six about to learn to read may not have mastered the phonological system—the system of auditory or articulatory <u>contrasts</u> on a series of relevant linguistic dimensions.

Thus, we may suppose that for Chomsky, even if the mature reader may read with underlying structures of grammar or sentence content playing an important role in his perceptions, the phonetic and phonemic analysis may be the "indicated" procedures for teaching children to read at early stages of linguistic development.

Developments at the Higher Levels of Linguistic Analysis.

Chomsky's matrix for linguistics (4) distinguishes four levels:

- (a) phonology

- (b) apparent phrase structure

- (c) underlying or "logical" phrase structure

    and

- (d) semantic structure of sentences.

In this formulation it would seem speech starts with perhaps some "notion" or "idea" which may be expressed by many super- ficially different sentences. This "semantic structure" is mapped onto an underlying or "logical" phrase structure. Transformations from this underlying structure generate a variety of sentences with apparent or surface phrase structures. For example, from a "kernel" sentence: (1) The poor sold the meat- transformations may be derived such as:

- (2) The meat was sold by the poor.

- (3) The poor were the sellers of the meat.

The final expression of the sentence is achieved when the "phonological component of a language maps the surface phrase structure onto a sequence of articulatory movements." We have noted above that the final mapping may occur into written form as well as spoken, phonological, form.

A number of above average, college level readers were

presented with sentences using a tachistoscope. In one task

they were asked to match the sentence they were shown with the

same or slightly different sentence they heard, indicating whether

the two sentences were the same or different. In a second task

they were required to tell whether two visually presented

sentences were the same or different. In this study entitled:

"How to Read Without Listening," Bever & Bower, (4) reported

that 92 per cent of the subjects were found to be more proficient

at the task requiring the matching between the auditory and

visual modes while the remaining 8 per cent excelled in the

within-mode matching. If the tentative interpretations of the

investigators prove correct, it was further found that 92 per

cent "listening" readers tended to forget from right to left

(that is to say, they remembered the beginnings of sentences

better than the ends) while the forgetting of the 8 per cent

"looking" or visual readers seemed to depend on the semantic

structure of the sentence since they perceived and recalled key

words, not particularly from left to right. The 8 per cent

visual readers seem to have found the "underlying subject" re-

gardless of the word in the apparent phrase structure presented

to them. The visual readers seem to have translated into simple

declarative form which has the surface form most similar to the

underlying phase structure or what Chomsky calls the "kernel."

It seems to be as though these 8 per cent visual readers read directly for meaning. The investigators reported that the faster comprehending "visual readers" they found appear to have instructed themselves, though it may be added, the reading field has labored long and hard to produce "visual readers."

The Bever and Bower study implies that decoding at word, phrase and sentence levels (rather than at the phoneme-grapheme level) can play a role in reading at an advanced level and, suggest as does the study by Gibson, Schurcliff, and Yonas, that, at least at advanced levels, speech or covert auditory processes need not play a role. Other studies suggesting that semantic and grammatical considerations may play a role at all levels of proficiency either do not raise the question of mediation by speech and auditory processes or suggest that these processes frequently do play a role in reading. The fact that Bever and Bower confirmed the notion that there are two kinds of readers shows that these findings are not contradictory. Since the studies all emanate from a linguistic point of departure, the need is manifested for modifying the notion that linguistics focuses on the "primacy of speech" for the teaching of reading.

A study by Rose-Marie Weber. "Grammaticality and the Self-correction of Reading Errors" (30) was based upon taped recordings of a class of first graders reading to each other - in the absence of their teachers at the end of their first year. Sixty-three

per cent of a substantial number of errors were of a nature
that did not affect the grammaticality of the sentence (i.e.
did not comprise grammatical "mistakes",) 29 per cent left
the sentence grammatical up to and including the error but
rendered it ungrammatical for the rest of the sentence and 8
per cent rendered the entire sentence ungrammatical. Among the
better readers, the "high group," errors that did not effect
grammaticality comprised a somewhat greater proportion of their
total errors while the categories of errors tended to be more
evenly distributed for the "low group." In the sample of errors
that were corrected, violation of grammaticality accounted for
approximately 61 per cent for the high group and about 45 per
cent for the low group. In a sample of errors uncorrected by
the high group, 96.2 per cent were of the type that did not effect
grammaticality, while 45 per cent of the uncorrected errors in the
low group did render the sentences ungrammatical. In short,
among good readers on the first-grade level errors tended not
to violate grammaticality and grammaticality accounted to some
degree for which errors were corrected. The trends were much less
distinct for poorer readers.

Weber's study raises the question as to what comprises
grammaticality. If, for example, poorer readers might be - as
they often in fact are - those who also speak a dialect different

from the one in which the text is written, might not a gram-
maticality that is alien to them fail to facilitate their
perceptions of the structures of the sentences and to a tendency
to leave uncorrected an error that renders the sentence
ungrammatical only as far as standard usage is concerned?
Kenneth Goodman (15) raised the question of dialect barriers to
reading comprehension and in a number of alternative ways it
has motivated and justified the exploration of the dialects of
the "urban deprived" under the rubric of research for the im-
provement of reading. A number of researchers have been laying
the groundwork that will make possible a thorough-going analysis
of the relation between the syntactic structure of a reader's
dialect and the dialect of the text. For example, Paul Cohen
in his "Outline of Research Results on the English of Negro and
Puerto Rican Speakers in New York" (11) attempted to identify
the sources of structural conflict relevant to reading. The
methods used for collecting data from a stratified sample of
Harlem residents included a "Perception Test" requiring, for
example, discriminations between "messed" and "mess" or "messed
up" and "mess up" and a "Classroom Correction Test" in which
respondents were asked to put sentences such as [He pick me]
into "good schoolroom English." A set of phonological features

were identified in the dialect which were shown to be those that

destroy the distinctions marking (a) the future tense, (b) noun

plurals, (c) third person singular, (d) the present tense, (e)

the past tense, etc. Incidentally, the investigator reported

finding no correlation between the "Classroom and Correction Test"

and the "Perception Test" (citing examples of extreme cases that

reached upper and lower ceiling values without mention of a

statistical measure) and remarked: "all of this would seem to

indicate the possibility that much time, energy, and money expended

on auditory perception training might be more profitably spent

elsewhere in the curriculum. Certainly this study and the

following one to be described suggest that the relevance of

auditory acuity for reading should be examined with considerable

circumspection.

The implications of dialect variations for reading seem to

be somewhat more complex, however, than may be at first antici-

pated. In a later paper, Labov and Cohen, (23) in analyzing

the "Systematic Relations of Standard and non-Standard Rules

in Grammar of Negro Speakers" report that many Negro speakers of

the non-standard dialects show evidence of mastering the perception

and comprehension of both standard and non-standard speech. In

production, however, they translate or form all utterances in the

non-standard dialect. When two dialects in production were noted,

they were found to be correlated with increasing socio-economic status. The methods used involved the establishment of situations to evoke formal and informal communication. The findings seem to be quite in accord with observations made in Europe, and elsewhere. In French speaking Canada, for example, radio, theatre, press frequently exhibit differences from the French of the general public who understand, but do not use the formal language. The Labov - Cohen findings, coupled with the results and interpretations of the Bever-Bower study and Weber's examination of errors make it seem reasonable and possible that under certain circumstances and with certain types of instruction, speakers of a non-standard dialect may be able to comprehend standard written text and even translate into their own dialect as they read silently. Certainly the problem turns out to be more subtle than it would at first appear.

Kolers (22) turned letters upside down, right to left and inverted his text in a number of studies in which these manipulations were intended to impede the skill of able college students although they were able to adjust to them. At first the experimental subjects were concerned with the transformations and comprehended little. Later they began to read fluently showing that "recognizing a word involves processes different from the mere recognition of its constituent letters" and that syntax and semantics play a role in producing errors and facilitating reading.

Levin and Turner (25) explored the relations between "Sentence Structure and Eye-Voice Span" for subjects ranging from second grade to university freshmen. A device for turning off the illumination on a text at any point while a subject read aloud made it possible to measure the "eye-voice span," or the amount of text a subject could keep saying after the turn off. As might be expected, the eye-voice span was found to be statistically significantly greater for materials presented as sentences than for lists. The investigators further concluded that the number of times the eye-voice span coincided with the ends of phases was statistically significantly greater than might have occurred merely by chance coincidence of a reader's eye-voice span ending at a phrase juncture. The rather involved measurement procedure for arriving at this may perhaps be questioned. It would have been more straight-forward to examine data as to the relatively frequency with which eye-voice span coincided with phase juncture in a large number of trials. Yet the results are comprehensibly in line with the findings of other experiments. Since this experiment confirms the well-established principle that reading occurs in terms of chunks of grammar and context, the true practical and theoretical value of the study will derive from the eventual analysis of the relationship between various grade levels, or developmental stages, and both the length of the eye-voice span and the specific grammatical structures of the stimulus materials.

Conclusion:

The linguist's understanding of language seems to be bringing new dimensions to the psychologist's and reading specialist's experimentation with the reading process. But the notion of "primacy of spoken language" must be modified in light of the data reviewed here to mean only that speech <u>preceded</u> writing in the history of man and precedes writing in the development of individuals. Spoken language may or may not play a role in the processing of written language. The data seem to suggest that whether or not it does depends on the individual, his reading level, and perhaps the nature of the text. The inter-relations among language systems, such as written and spoken ones or varieties of dialects, may be quite complex and vary from individual to individual. Yet linguistic structure and meaning incontrovertibly play an important role in reading--as does the translation of letters to speech sounds (in the case of alphabetically written languages).

The material reviewed in this paper clearly defeats any earlier and naive expectation that a "linguistic approach" might be formulated that would radically depart from previously developed instructional procedures and successfully compete with them. Indeed the doctrinal disputes within linguistics as they are manifested in connection with the reading process, seem to be

but slightly modified echos of the debates between advocates of
phonics and basal reading in the reading field. Yet the added
sophistication that linguistics brings to the experimentation
is of undeniable value.

The reviewer is encouraged by the material discussed in
this paper to anticipate that investigators who have attended
to linguistics are en route to identifying a number of important
principles of the reading process, of how reading skill is
acquired, and of how human language processing capacities develop.
There are some hints in this paper, and considerable evidence else-
where, than among these principles is the fact that at least some
reading skill and much language acquisition is the consequence
of explorations and learning strategies that at least some learners
initiate themselves. The implications for instruction are not
that the isolation of these principles will lead to the development
of "bigger and better" all-encompassing, panacea-like methods
of teaching reading. Instead it may be expected that the
effective and expert reading teacher (a) will need to understand
a rather complex set of principles, (b) will have to be able to
recognize each of the specific instances in which each principle
is applicable, and (c) will have to be able to apply an
appropriate procedure (including, perhaps, appropriate waiting
strategies in which self-instruction occurs) in the proper
instances.

To despair of developing such expertise on the scale
necessary to teach reading in the schools is to despair of
improving the effectiveness of reading instruction. The in-
escapable facts are that for language processing there are
developmental stages in maturation and learning, that there
marked variations among individuals, and that the underlying
principles of learning and language processing are complex. No
single, blindly-applied method can be universally appropriate.
Despondency as to the likelihood of developing the expertise to
cope with these facts may, in part, be generated by a history of
concentrating a major portion of available resources and talent
to developing relatively monolithic methods rather than to
developing extensive expertise among instructors of reading.
But the principles that seem to be emerging from the research
generated by the partnership that introduced linguistics into
research on reading may call for and <u>warrant</u> new approaches to
developing expertise among instructors of reading. The develop-
ment of germ theory did not bring medicine a panacea for curing
all ills--as some might have expected at first--but lead to
the development of large number of specific drugs and curative
procedures and to the development of physicians with more pro-
found understanding of the principles of physiology and greater
skill in their craft.

References

1. Allport, Floyd H. _Theories of Perception and the Concept of Structure._ New York: Wiley, 1955.

2. Betts, Emmett A. "Reading: Linguistics," _Education_, May 1963, 515-526.

3. Bellugi, Ursula, Brown, Roger (Editors). _The Acquisition of Language._ Monograph of the Society for the Study for Research in Child Development, 29, 1, 1964.

4. Bever, Thomas, and Bower, Thomas. "How to Read Without Listening," _Project Literacy Reports_, No. 6, (January 1966), 13-25.

5. Bloomfield, Leonard, and Barnhart, Clarence L. _Let's Read._ Detroit: Wayne State University Press, 1961.

6. Carton, Aaron S. "Theory of Baby-Talk," Review of Bellugi, Ursula and Brown, Roger (Editors) _The Acquisition of Language_, Contemporary Psychology, Volume 10, No. 11, 1965, 526-527.

7. Cattell, James MaKeen. "Ueber der Zeit der Erkennung und Bennenung von Schriftzeichen, Bilde: n, und Farbern," _Philosophische Studien_, 2, (1885), 635-650.

8. Chall, Jeanne S. _Learning to Read: The Great Debate._ New York: McGraw Hill, 1967.

9. Cherry, Colin. _On Human Communication._ New York: Wiley-Technology, 1957.

10. Chomsky, Noam. "Comments for Project Literary Meetings," _Project Literacy Reports_, No. 6, (September 1966), 1-8.

11. Cohen, Paul S. "Outline of Research Results on the English of Negro and Puerto Rican Speakers in New York City," _Project Literacy Reports_, No. 7, (September 1966), 13-18.

12. Gibson, Eleanor J. "Experiments on Four Aspects of Reading Skill and Its Attainment," _Project Literacy Reports_, No. 5, (November 1965), 1-12.

13. Gibson, Eleanor J., Farber, James, and Shepela, Sharon. "Test of a Learning Set Procedure for the Abstraction of Spelling Patterns," Project Literacy Reports, No. 8, (July 1967), 21-30.

14. Gibson, Eleanor J., Shurcliff, Arthur, and Yonas, Albert. "The Role of Pronounceability in the Perception of Pseudo-words by Hearing and Deaf Subjects," Project Literacy Reports, No. 7, (September 1966), 67-72.

15. Goodman, Kenneth S. "Dialect Barriers to Reading Comprehension," Elementary English, December 1965, 853-860.

16. Goodman, Kenneth S. "Reading: A Psycholinguistic Guessing Game," Paper read at the 1967 meetings of the American Educational Research Association.

17. Hardyck, Curtis, Petronovich, Lewis F., and Schipp, Thomas. "Reading as a Motor Skill: A Mediation Model," Project Literacy Reports, No. 1, (July 1964), 14-16.

18. Harlow, Harry F. "Learning Set and Error Factor Theory," In S. Koch (Editor) Psychology: A Study of a Science. Volume 2, New York: McGraw Hill, 1959, 492-537.

19. Hockett, Charles. "Proposal for a Research Program in Written English and Its Relation to Spoken English," Project Literacy Reports, No. 2, (September 1964), 12-13.

20. Hockett, Charles F. "Relationships Between Written and Spoken Englsih," Project Literacy Reports, No. 5, (November 1965), 32-33.

21. Huttenlocher, Janellen. "Comprehension With Use of Phonic Teaching Methods," Project Literacy Reports, No. 1, (July 1964), 31-32.

22. Kolers, Paul A. "Reading As A Perceptual Skill," Project Literacy Reports, No. 1, (July 1964), 19-21.

23. Labov, William and Cohen, Paul. "Systematic Relations of Standard and Non-Standard Rules in the Grammar of Negro Speakers," Project Literacy Reports, No. 8, (July 1967),66-84.

24. Lefevre, Carl A. _Linguistics and the Teaching of Reading._
     New York: McGraw Hill, 1964.

25. Levin, Harry and Turner, Elizabeth Ann. "Sentence Structure
     and the Eye Voice Span," _Project Literacy Reports_, No. 7,
     (September 1966), 79-87.

26. Miller, G. and Isard, S. "Some Perceptual Consequences of
     Linguistic Rules," _Journal of Verbal Learning and Verbal
     Behavior_, No. 2, (1963), 217-228.

27. Morris, Charles W. _Signs, Language, and Behavior._ New York:
     Prentice Hall, 1946.

28. Osgood, Charles E. and Sebeok, Thomas A. (Editors).
     Psycholinguistics: A Survey of Theory and Research Problems.
     Baltimore: Waverly Press, 1954.

29. Venezky, Richard L. "Studies of the Initial Reading Process,"
     Project Literacy Reports, No. 8, (July 1967), 31-36.

30. Weber, Rose Marie. "Grammaticality and the Self-Correction
     of Reading Errors," _Project Literacy Reports_, No. 8,
     (July 1967), 53-59.

31. Weir, Ruth H. and Venezky, Richard L. "Spelling to Sound:
     Rules and a Model," _Project Literacy Reports_, No. 2,
     (September 1964), 9-11.

32. Whorf, Benjamin L. _Language, Thought, and Reality._
     (Selected writings, Carroll, J. B. Editor) New York:
     Wiley, 1956.

33. Williams, Joanna P. "Systematic Investigation of Certain
     Variables Basic to the Development of Effective Instructional
     Sequences in Reading," _Project Literacy Reports_, No. 1,
     (July 1964), 10-33.