III. MATHEMATICAL LINGUISTICS

Mathematical linguistics involves the application of various mathematical ideas and methods to the problems of clarifying the fundamental properties of natural languages and of providing a satisfactory notation for representing linguistic structures. It also involves research in pure mathematics-- those areas of mathematics which have turned out to have linguistic applicability, but which themselves are in need of further work, for example the theory of context-free languages. At the present time, there is a great deal more work being done on mathematics within the discipline of mathematical linguistics than on linguistics. I see my task as dealing with the problem of the fundamental properties of languages, so that it will become clearer just what mathematical tools are appropriate for the study of language. One clarification I think has already been obtained, namely that formal logic is perhaps the single most important tool (for the study of semantics), not the theory of context-free languages, the area which has of late received the most attention from mathematical linguists.

The work on mathematical linguistics has been closely correlated with research reported in the previous section. D. T. Langendoen worked under the project full time in the spring quarter of 1967; J. T. Heringer, Jr., part time during the spring and summer quarters of 1967.

I have been primarily concerned with two problems in the foundations of linguistics: (1) the nature of the representation of semantic structure and (2) explanation in syntax.

Concerning (1), I have developed some arguments to show that there are fundamentally two basic aspects of semantic structure: meaning and semantic content. In a preliminary work-paper "On selection, projection, meaning, and semantic content" (see p. 100), I maintained that the semantic content of a

sentence is the aggregate of what is predicted of the individual noun phrases (arguments) which appear in that sentence. The same characterization can be made of the semantic content of discourses. Meaning is fundamentally a property of lexical items, and is arrived at by processes which are not generally well understood from exposure to the lexical items in linguistic contexts. In that paper I also held that, properly speaking, there is no such thing as the meaning of a sentence or a discourse, but it has since been pointed out to me that it is a perfectly straightforward matter to define those concepts. I am presently working on a paper, hopefully publishable, which will enlarge upon and clarify these ideas.

Concerning (2), I have shown in a paper "The accessibility of deep (semantic) structure" (see p. 118; to appear in P. Rosenbaum and R. Jacobs, eds., <u>Studies in English Transformational Grammar</u>, Ginn-Blaisdell, 1968) that it is possible to explain the existence and obligatory or optional character of some transformational rules of English on the grounds that their application (or occasionally non-application) is necessary that the underlying semantic structure be perceived by a perceptual apparatus such as the human brain without external memory aids. I have reason to believe that the ideas sketched in this paper can also be enlarged upon and made to fit into a general theory of linguistics.

The work of J. T. Heringer has consisted mainly of critical reading and reviewing of papers related to mathematical linguistics. One of these reviews is presented as part of this report (p. 128).

D. T. Langendoen
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