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This report comprises a description of the linguistic research carried out at the University of Arizona in 1967 on the subject of language rules. The approach originally envisaged was to consider the possibility that rules of language are informed and supported by, take their existence only within, and are thus virtually inseparabl" from, the entire way of life within which the language functions. It was proposed, in particular, to examine relevant work done by Mead and Skinner. The first task was to survey the mass of literature on the question: this resulted in a bibliography of some 2,500 titles. It was found that the prevailing drift of opinion on the part of scholars in linguistics, philosophy, psychology, and education was to the effect that criticism such as those of Chomsky had definitively shown the inadequacy of "behavioristic" explanations of language such as those of Mead and Skinner. This called for a careful examination of the implications of recent work in generative and transformational grammars, subsummable under the general topic "Mentalism in Linguistics." A Symposium on Thought and Language was held at the University o f Arizona in February 23-24, 1968, the proceedings of which will be published in 1969 by the University of Arizona Press under th e title "Thought and Language: An Interdisciplinary Symposium." Authors will be J.L. Cowan, G. Mandler, C. Osgood, Z. Vendler, P. Ziff, and R. Wells. See related document AL 001 607. (AMM)

FINAL REPORT
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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

AN ANALYSIS OF THE EXPLANATIONS OF LINGUISTIC RULES BY G. H. MEAD AND B. F. SKINNER

May 15, 1968

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

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I. INTRODUCTION. The problem to be attacked in this study was, briefly, what sort of thing is a rule of language?

It is clear, to begin with, that there are rules of language--grammatical, semantical and logical. The actual linguistic corpus to which any human being is ever exposed can only be finite; yet the number of sentences of a language such as English, sentences well formed, meaningful and nicely fitted within an implicative net, is infinite. Thus in learning a language one does not, one cannot, merely learn a finite set of sentences; one learns, perhaps a finite set of elements, but one must also learn ways of patterning these elements into a potentially infinite set. Consider the following: "A weeping giraffe stood on its head mournfully munching buttercups." Quite probably no one has ever heard or seen this sentence before. Yet most English speakers will agree that it is a proper English sentence, will understand more or less what it means, and will see that it implies, for example, the sentence: "An animal stood on its head." Since they have never encountered these words in quite this combination and order, their agreement must presumably be based on the common learning of rules for combining elements they have encountered, rules which transcend the examples on the basis of which they were learned.

Yet while the existence of rules of language is thus obvious, it is far from obvious just what sort of thing these rules might be. They are not, to begin with, consciously articulated symbolic formulations, sets of signs. This is the sort of thing descriptive linguists are trying to attain. But no linguist thinks he has yet attained a completely adequate set for any natural language. Still less is the ordinary speaker, whatever his mastery of the language, capable of stating explicitly the rules on the basis of which he operates.

Even more significantly, however, no such formulation, even if obtainable, could actually itself constitute the rule. It might be said to describe or denote or represent or mean the rule. But it would not itself be identical with that which it described or denoted or represented or meant.

One factor which makes this point difficult to see is that very often either the name or the thing named will meet the requirements of a situation equally well. Thus if someone should ask, "Who wrote Waverly?" circumstances might be such that another could actually point to the author himself.

Yet one might also be satisfied with the mere name, "Scott". In spite of this, however, it is clear that there is a difference between the name and the thing named, and for some purposes the difference may be essential. If it is a matter of hanging him, one needs the man himself.

The difference may be further obscured by an additional factor which should rather clarify it. Often it is actually the name or description rather than the thing itself in which we are interested. Thus to someone's pointing out the author of Waverly, another might have to reply, "Yes, but who is he?" This interest in the description is perhaps especially intense in a science such as linguistics where the thing itself is, in a sense at least, known to every user of the language while an adequate description of it is very hard to come by.

Thus it might be well to take as an example something which can easily be described and its description. Consider an infinite series of numbers that goes 3, 9, 19, and so on. One might now say, "The rule which generates this series is $x = 2n^2 + 1$ where x is the member of the series and n its ordinal number in the series." But clearly there is a difference between this series of marks and a rule which actually generates series of numbers. Indeed, the marks do nothing save sit on the page without the addition of the rules for their use which alone give them life.

Since, then, we cannot identify the rule with its description, the articulated symbolic formulation, we might next attempt to locate it in the behavior of the users of the language. We might, for example, say something to the effect that the rule is simply a regularity in the behavior of these users. Unfortunately, however, this approach seems no more satisfactory than its predecessor.

By "regularity in the behavior of the users," we might, on the one hand, mean either the entirety of their behavior or some proper part of that behavior. But neither of these will do. The entirety of the actual behavior (and thus all proper parts of that behavior) of any individual or group is finite. Given any finite corpus of behavior or its consequences there will be an indefinitely large number of distinct, non-equivalent rules which it will exemplify. Thus the portion of the series actually developed above, for example, might just as well be the beginning of the very different series, $x = n^3/3 + 11n/3 - 1$.

If, on the other hand, we do not mean by "regularity in the behavior of the users" either the entirety of their behavior or any proper part of it, then it is difficult to see what else we might mean. In this case we would seem to have done no more than make a purely verbal substitution of the word "regularity" for the word "rule". This hardly constitutes an advance in understanding.

Again, however, there is a further strenuous objection to a supposed explanation of rules in terms of regularities. This objection again would hold even if those above could be met. The regularities in language have a source. It is not a mere matter of chance that those who know the language agree with respect to new material. But it is exactly this source of regularity for which we are searching in searching for the rule. Thus the rule must be something over and above the mere regularity itself.

The answer to our question toward which most contemporary linguists would tend, at least on a vague theoretical level, to gravitate is that the source of linguistic regularity is ultimately certain physiological structures, states and functionings, nervous and muscular conditions. These, being in part universal in the species, can explain the universality of language and the great similarity of all known languages. Specific modifications of these structures and functionings through experience, generally modifications in the direction of eliminating a range of pre-existent potentialities, can then explain the differences between different languages.

Alas this sort of explanation will not do either. The study of physiology is certainly an interesting and important one. The discovery of correlations between neurological conditions and linguistic capacities and incapacities is surely of great value. But the very possibility of such correlation implies two sorts of entities to be correlated. We now know very little of such correlation. We certainly do not say that someone knows a given language because we have discovered that his brain is in a certain state. But suppose we could attain perfect physiological knowledge and had discovered in the first million subjects we examined that the capacity to speak English, say, was exactly correlated with some particular physiological state, call it x. If the next subject after him had exactly state x but no English at all we should have to recognize that he did not have the rules. While it is conceivable, in short, that linguistic rules and

the mastery of them are correlated with particular physiological states, it is also conceivable that there is no such correlation. This is enough to prove that the two cannot be identified.

It would thus seem that all the most promising avenues of escape turn out on exploration to be blind alleys, and our problem remains a problem indeed.

It would be difficult, moreover, to imagine a problem of greater ultimate significance both to educational research and to educational practice. Especially since mathematics is, for present purposes, essentially a language or set of languages and even the empirical sciences can profitably be considered hypothetico-deductive logical systems, a very great part of what we are trying to teach consists simply of linguistic rules in the present sense. Obviously we should be able to do a much more competent job of teaching them if we were clearer about just what sort of thing it was we were trying to teach and in just what learning it consisted.

II. METHOD. The approach to the problem originally envisaged was to consider the possibility that rules of language are informed and supported by, take their existence only within, and are thus virtually inseparable from, entire way of life within which the language functions. It was proposed, in particular, to examine the work along these lines done by G. H. Mead and B. F. Skinner.

In its original conception the project was to take place during February through August 1966 when the sabbatical leave of the investigator would have allowed him to devote his full time to the project during the entire seven months period. The University of Arizona would thus have supported the investigation during the first four months and DHEW during the last three months. The delay in approval which resulted in re-scheduling the project to February through August 1967 thus made impossible the procedure originally outlined. The period February through May 1967 was the second half of the investigator's first year as the Head of his Department. His time was thus fully occupied with the work involved in instituting a new doctoral program, completely re-designing the curriculum and other departmental procedures and policies and recruiting new personnel in addition to normal administrative and teaching duties and completing prior research commitments. The time of those graduate students best qualified to serve as research assistants was also then fully committed. It was

therefore impossible to initiate the project during this period and no Federal funds were then drawn. From June through August 1967 the investigator was able to devote full time to the project. It was also possible then to secure the services of well-qualified research assistants. It was during this period that the entirety of the DHEW funds for the project were expended.

The first task was to make a full and careful survey of the mass of literature bearing on the topics in question. This momentous chore was essential clearly to identify points where further work would most assist ongoing research in the area--to assure advancement of this work rather than being irrelevant to it on the one hand or a duplication of it on the other. It was soon discovered that DHEW funds available for this part of the project would be insufficient. Fortunately, however, we were able to secure additional funds under an NSF Institutional Grant and this work was brought to a successful completion. We concluded with a bibliography of some 2,500 relevant titles examined.

This initial survey of the literature soon led to the conclusion that the magnitude, complexity and interdisciplinary ramifications of the project far exceeded all original expectations and also far exceeded the potentialities of the original DHEW grant.

In particular it was found that the prevailing drift of opinion on the part of scholars studying language--most especially those in linguistics proper, but also to a great extent those in philosophy, psychology and education--was to the effect that criticisms such as those of Chomsky had definitively shown the inadequacy of "behavioristic" explanations of language such as those of Mead and Skinner. If this opinion was correct and explanations of the type of Skinner and Mead were to be ruled out on other grounds, it would clearly be fruitless to examine at length their adequacy with respect to the rather different conceptual difficulties with which this project was initially concerned. What was therefore required was a careful examination of the implications--within linguistics and beyond linguistics in education, philosophy and psychology--of recent work in generative and transformational grammars, implications subsummable under the general topic "Mentalism in Linguistics." On these grounds it was decided to utilize the entirety of the limited research time provided by the DHEW grant for this necessary and indeed unavoidable preliminary to the entire project as originally conceived.

At the same time there occurred to the investigator the idea of advancing still further research into the area of the project by enlisting the aid of other scholars in the field. It was decided that this could best be accomplished by holding an interdisciplinary symposium devoted to these problems and including as a part, but only as a part, the investigator's results from his DHEW funded research. Because of the instructional value of this symposium, the University of Arizona was able to provide the necessary funds. The participation of six eminent sholars was secured. Each of these men is a full professor in his institution, the author of one or more books and numerous articles on the topics involved, and a recognized authority in the field. The symposium was held on the University of Arizona campus on February 23 and 24, 1968. Proceedings will be published in the near future by The University of Arizona Press under the title Thought and Language: An Interdisciplinary Symposium. In the fullest sense that volume will therefore constitute the final report on this project. It has seemed, nevertheless, desirable to submit this report also as an explanation of how the project as originally conceived developed into an enterprise of such a magnitude and character.

III. RESULTS. The contents of the volume will be as follows:

1. "Introduction," by J. L. Cowan, The University of Arizona.

2. "Mentalism in Linguistics," by J. L. Cowan, The University of Arizona. An examination of the supposed mentalistic foundations and implications of recent work in linguistics.

3. "Words, Lists and Categories: An Experimental View of Mental Organization," by George Mandler, The University of California at San Diego. Recent theory and experiments on long term memory for words and categories of words and their relevance to an experimental analysis of semantics.

4. "On the Semantics of Interpersonal Verbs and Norms of Interpersonal Behavior," by Charles Osgood, The University of Illinois. A theoretical orientation which attempts to relate behavioral theory of interpersonal perception and behavior to a behavioral conception of meaning as the critical intervening variable; an a priori intuitive analysis of the

semantic features of interpersonal verbs and a variety of empirical studies on the norms of interpersonal behavior which utilize such hypothesized features for analysis and interpretation.

5. "Say What You Think," by Zeno Vendler, The University of Calgary. A comparison between the objects of ilocutionary acts and the objects of thought. Issues such as the concept of a proposition, referential opaqueness and the importance of language to thinking.

6. "Understanding," by Paul Ziff, The University of Illinois at Chicago Circle. What is understanding what is said? Is it a matter of behavior, of making inferences, providing paraphrases? If none of these then what?

7. "Comprehension and Expression: The Understanding of Rules," by Rulon Wells, Yale University. The ability of language to express thought; the M.I.T. concept of a rule as essentially recursive: the connection between other human abilities and a language.

8. Bibliography.

IV. DISCUSSION AND CONCLUSIONS. See the introduction to the volume for an extended discussion of the background of the materials included, the basic results achieved and the implications of these results.

V. SUMMARY. The problem attacked was that of the ontological status of rules of language--what sort of thing a rule of language is. An initial extensive survey of the literature mapped the complexity and interdisciplinary character of the problem. A symposium was arranged allowing contributions from several outstanding scholars in related fields to be added to the studies directly supported by the DHEW grant. Results are to be published as a book by The University of Arizona Press under the title Thought and Language: An Interdisciplinary Symposium. Contents: "Introduction," by J. L. Cowan; "Mentalism in Linguistics," by J. L. Cowan; "Words, Lists and Categories: An Experimental View of Mental Organization," by George Mandler; "On The Semantics of Interpersonal Verbs and Norms of Interpersonal Behavior," by Charles Osgood; "Say What You Think," by Zeno Vendler; "Understanding," by Paul Ziff; "Comprehension and Expression: The Understanding of Rules," by Rulon Wells; Bibliography. These papers substantially advance work on the initial problem on several fronts and at the same time indicate areas remaining to be attacked in philosophy, psychology, linguistics and education.

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