XXI. LINGUISTICS

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RESEARCH OBJECTIVES

The ultimate objective of our research is to gain a better understanding of man's mental capacities by studying the ways in which these capacities manifest themselves in language. Language is a particularly promising avenue because, on the one hand, it is an intellectual achievement that is accessible to all normal humans and, on the other hand, we have more detailed knowledge about language than about any other human activity involving man's mental capacities.

In studying language it has long been traditional to deal with certain topics such as pronunciation, inflection of words, word formation, the expression of syntactic relations, word order, and so forth. Moreover, the manner in which these topics are treated has also been quite standard for a very long time. This format has on the whole proved to be quite effective for the characterization of all languages, although quite a few shortcomings have been noticed and discussed at length. It would seem plausible that the main reason for the success of the traditional format is that it was adequate to the task, and to this extent the traditional framework embodies true insights about the nature of language. Much of the effort of our group continues to be devoted to the further extension of the theoretical framework of linguistics and to the validation of particular aspects of the framework. As our work progresses it becomes ever clearer that a single framework must indeed underlie all human languages for when really understood the differences among even the most widely separate languages are relatively minor.

The preceding discussion leads quite naturally to the question, "What evidence from outside of linguistics might one adduce in favor of the hypothesis that all languages are constructed in accordance with a single plan, a single framework?" It seems to us that the most striking evidence in favor of the hypothesis is, on the one hand, the rapidity

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with which children master their mother tongue, and on the other hand, the fact that even a young child's command of his mother tongue encompasses not only phrases and utterances he has heard but also an unlimited number of phrases and utterances he has not previously encountered. To account for these two sets of facts, we must assume that in learning a language a child makes correct inferences about the structural principles that govern his language on the basis of very limited exposure to the actual sentences and utterances. In other words, we must assume that with regard to matters of language a child is uniquely capable of jumping to the correct conclusions in the overwhelming majority of instances, and it is the task of the student of language to explain how this might be possible.

A possible explanation might run as follows. Assume that the human organism is constructed so that man is capable of discovering only selected facts about language and, moreover, that he is constrained to represent his discoveries in a very specific fashion from which certain fairly far-reaching inferences about the organization of other parts of the language would follow automatically. If this assumption is accepted, the next task is to advance specific proposals concerning the devices that might be actually at play. The obvious candidate is the theoretical framework of linguistics, for while it is logically conceivable that the structure of language might be quite distinct from that of the organism that is known to possess the ability to speak, it is much more plausible that this is not the case, that the structures that appear to underlie all languages reflect quite directly features of the human mind. To the extent that this hypothesis is correct—and there is considerable empirical evidence in its favor—the study of language is rightly regarded as an effort at mapping the mysteries of the human mind.

M. Halle

A. ON THE NOTION 'STRONGER DERIVATIONAL CONSTRAINT'

The notion 'derivational constraint' as put forward by Lakoff represents an extraordinarily powerful device. In the general sense of the term, any conceivable condition holding over any portion of a derivation can be expressed as a derivational constraint. Thus, if the concept is to have any empirical consequence, it is necessary to severely limit its generality as Chomsky has shown. There might be limitations placed on how many different levels of a derivation could be related by a DC, for example, or even on what levels could be so relateable.

Lakoff has attempted to describe certain facts about the order of logical elements as a derivational constraint holding between (semantic) deep structure and later derived structure. There are some important empirical considerations inherent in that attempt. For example, if the semantic facts are to be stateable at the level of deep structure by reference to relative height of logical elements, negation and quantifiers must be regarded, as Lakoff and Carden have observed, as predicates. That logical elements behave in significant respects like verbs is an empirical claim that has not yet received empirical support. Further, the transformations required to produce the proper surface structures are of a type not independently motivated, and perhaps even excluded on independent grounds (cf. Chomsky). Still worse, it is probably the case that any element of a sentence that can be focus—in the sense of Chomsky and of Akmajian—can be negated. But as Chomsky has pointed out, such elements need
not be deep-structure constituents, and may even be fractions of words.

Putting aside for the moment the (almost total) reservations mentioned above, I would like to consider Lakoff's claim that DC's, in their most general sense, are required in the theory of grammar. As I have suggested, any extension of the power of grammatical devices must be empirically justified. Thus, if two-point DC's were shown to be necessary, it would not follow that n-point DC's are motivated. On the contrary, since n-point DC's permit a wider class (indefinitely wide) of possible grammatical processes, they likewise widen the class of 'possible human languages.' But such widening at this stage is the opposite of what the goals of linguistic theory should be.

I shall show that these theoretical considerations, as well as the facts of English, argue against the proposal put forward by Lakoff. After presenting arguments in Lakoff that, given certain assumptions about deep structures and transformations, logical scope can be expressed as a DC between deep structure and late derived structure, Lakoff offers the following justification for expanding the power of the grammar:

Since [DC's such as the one guaranteeing the proper order of logical elements] only mention underlying structures \( P_1 \) and surface structures \( P_n' \), they leave open the possibility that such constraints might be violated at some intermediate stage of the derivation. My guess is that this will never be the case, and if so, then it should be possible to place much stronger constraints on derivations ... by requiring that all intermediate stages of a derivation \( P_1 \) meet the constraint, not just the surface structure \( P_n' \).

As I have pointed out, such a strengthening would actually be a weakening of the explanatory power of the grammar. Thus, the burden of proof would rest on the proponent of such a device to show, for example, that the intermediate stages of a derivation must be constrained in the manner proposed, not merely, as Lakoff has stated, that they can be. On theoretical grounds, then, Lakoff's claim is not a candidate for serious consideration. It is perhaps of some interest in this regard, though, that not even the claim Lakoff has made — that the DC for order of logical elements can be expressed as a constraint on every phrase marker of a derivation — receives empirical confirmation.

The constraint that Lakoff finally proposes I have paraphrased as (1):

1. If in deep structure, \( L(\text{logical element})_1 \) commands \( L_2 \), then at any subsequent level where \( L_2 \) commands \( L_1 \), \( L_1 \) must precede \( L_2 \).

One of Lakoff's examples is a set of sentences discussed by Jackendoff:

2. Not many arrows hit the target.
3. Many arrows didn't hit the target.
4. The target wasn't hit by many arrows.

Lakoff uses DC (1) to explain the dialect in which (4) has no reading in common with (3). The deep structure that he offers for (3) is (5):
If the passive transformation were to apply on $S_3$, then the result of 'quantifier lowering' on $S_2$ and $S_1$ would be in violation of DC (1). For in (5), many commands not; but passive and lowering would produce (4) in which not commands and precedes many. DC (1) thus prevents the structure underlying (3) from producing (4). But I think this analysis is inadequate because if subsequent rules restore the proper command-precede relationship, the resulting string has the correct interpretation. If, for example, a rule of NP movement or topicalization were to apply, the resulting sentence (6), though rather awkward, would be synonymous with (3) for most speakers (even those for whom (4) cannot be synonymous with (3)).

6 By many arrows, the target wasn't hit\(^{10}\) (i.e., By many arrows, the target was missed.)

The following set of sentences, also discussed by Jackendoff,\(^4\) produces rather clearer results:

7 Not many of the demonstrators were arrested by the police.
8 Many of the demonstrators weren't arrested by the police.
9 The police didn't arrest many of the demonstrators.

Here, the structure underlying (8) — in the dialect under consideration, in which (8) and (9) have no reading in common — \underline{must} undergo passive.
In (10), many commands not, but if passive does not apply on $S_3$, in the resulting sentence (9), not commands and precedes many. Again, however, even if passive has not applied, rules subsequent to lowering can restore the proper command-precede relationship and produce sentence (11) synonymous with (8).

11 Many of the demonstrators, the police didn't arrest.

I think that these examples, and probably similar ones involving adverb movement, demonstrate that it is not just unnecessary for a DC to keep track of the order of logical elements at every stage of the derivation, but rather that the intermediate stages must be disregarded. That is, the only relevant stage for determining the relationship between meaning and order of logical elements is late derived structure (presumably shallow or surface structure).

H. B. Lasnik

Footnotes and References

6. Here, I do not mean that within a given grammar the addition of a device such as Lakoff has proposed would result in weakened generative capacity. I am concerned, rather, with comparing theories. Thus, it is clear that regardless of what sentences are or are not generated by a particular grammar, if such DC's are available, they can be present or absent in a grammar, and, consequently, a larger class of grammars would be available to the child learning the language. It is also unclear—if the theory of grammar has available to it devices relating any level with any other levels—what principled way there would be to exclude all manner of ad hoc and counter-intuitive devices.

7. Lakoff points out that the DC as stated can be violated at surface structure if the L that commanded in deep structure has "much heavier stress." Actually, the phonetic considerations are more complex than that, but such considerations are irrelevant to the present discussion. For anyone interested in pursuing the problem, I have suggested a framework in which the phonetic facts can be considered.  

8. H. B. Lasnik, "The Scope of Negation" (unpublished ms.).


10. If there is some difficulty obtaining the reading I am suggesting, try substituting sentence (a) which is in all relevant senses parallel to (6). (Carden 3 gives the same source for 'many NP's' and 'many of the NP's'.) 

   a) By many of the arrows, the target wasn't hit.

11. It should also be recalled (as I stated earlier) that even if other things were equal; that is, even if Lakoff's proposal were not descriptively inadequate, theoretical considerations would require that the most restricted device that accounts for the facts be adopted.

B. A CONSOLIDATION EFFECT IN SENTENCE PERCEPTION

For several years we have been using a particular experimental technique to explore the problem of segmentation of speech. Briefly, the technique requires listeners to locate a very short burst of noise (a "click" of 30-40 ms duration) in sentences. Typically, sentence and click are presented dichotically. For example, in his right ear, a subject might hear the sentence, "John's other wife wears her hair in a bizarre fashion," while in his left ear he will hear a click sometime during the course of the sentence. Immediately following the presentation of the stimuli, the subject must indicate his judgment of the click location (i.e., by noting which word or speech sound the click occurred in or adjacent to).

We have interpreted the accuracy of location and the distribution of errors for clicks objectively placed at various points in sentences as indicative of their perceptual segmentation. Much of the earlier research has shown that there is, indeed, a correlation between distributions of errors and the constituent structure of sentences, and further, that errors in click location occur during and as a consequence
of the perceptual processing of sentences. (For a review of some click research studies see Garrett and Bever, Holmes and Forster, and Berry for recent work in other laboratories.)

Much recent work has been aimed at the question: "Is the location of clicks responsive to all constituent structure boundaries, or is it responsive only to certain varieties of boundaries?" Initially, we assumed that the degree of the syntactic effect on click location could be predicted by the number of constituents that a click interrupted at any point in a sentence; i.e., that every constituent boundary contributed in some measure to the effect. Very early, however, various irregularities in our experimental results led us to consider seriously the possibility that only certain constituent structure boundaries were effective in producing click location errors. We took two approaches to this question: (i) a concerted effort to find an effect of minor constituent structure boundaries, and (ii) an attempt to contrast the effects of boundaries of structures that were immediately dominated by a sentence node (e.g., relative clauses) with the effects of constituent boundaries of structures not immediately dominated by a sentence node. These research efforts have thus far produced no strong evidence of an effect of minor constituent structure and have provided strong support for the view that the presence of an embedded sentence is an important determinant of click location errors (see references cited above).

From the results that "major" constituent boundaries (i.e., S-dominated constituents) have an important effect on location errors while "minor" constituent boundaries (e.g., the boundary between a verb and its object noun) have a miniscule effect, if any, we could derive two conclusions. The first of these is that the click location paradigm is simply insensitive to minor constituent structure and reveals only the grosser aspects of the processing of sentences. A second possible conclusion is, however, that clicks are indeed sensitive to all of the constituent structure that is present at the point in sentence processing where click location errors are normally made, but that minor constituent structure boundaries have not been developed at that point.

We have attempted an experimental test of this latter view. To do this, we need to discover whether click location errors are sensitive to minor constituent boundaries under conditions in which (we believe) such boundaries have been developed. We assumed that if a listener is given more than the usual amount of time to consider a sentence, a more detailed analysis will be available to him. The logic of the argument is then straightforward. If under such circumstances clicks are affected by minor constituent boundaries, then the failure of such boundaries to show an effect in past experiments may plausibly be interpreted as evidence that minor constituent boundaries are developed relatively late in the processing routine, and are a consequence of relatively late steps in the analysis of the sentence.
The experiment is a difficult one to perform. In cases where one gives additional computational time, one wishes at the same time to postpone the making of a click location error. That is, the occurrence of the error must be displaced in time to the point at which minor constituent structure is, presumably, built up if we wish to make a perceptual claim about such errors.

We have employed the following paradigm. Subjects in an experimental group are exposed to two immediately successive presentations of the same sentence. The first occurrence of this sentence does not contain a click; the second occurrence does. The location errors are compared with those for a control group which receives only a single presentation of the sentence containing a click. The assumption is that the initial presentation of the sentence with no click will provide the listener with the basis for developing a more fine-grained analysis of the sentence on its second occurrence. If the click location errors are sensitive to whatever constituent boundaries are present, one would expect an increase in effects of minor constituent boundaries under these conditions.

This research is still in progress. We have run two groups of experimental and control subjects; both show the expected effect, and it is statistically significant.

Experiment 1. In the first comparison 10 Ss were run in each of the groups ("Single presentation group" = SPG and "Double presentation group" = DPG). Sentences such as (1) were presented (click location is indicated by a /):

(1) In order to wave to Harryₐ, Samₐ pushed open the window.

The expectation was that in the DPG, there would be an increment in the subjective location of clicks at the boundary immediately following Sam, (B), and no increment for the boundary immediately preceding Sam, (A), (the "major" break in the sentence). This assumes that break A is developed (at the point when click errors are made) in the single presentation group, but break B is not yet developed. The results were consistent with this expectation. Unfortunately, the outcome is confounded with a general increase in accuracy as a consequence of repeating the sentence. The error distributions are more concentrated on the objective position in DPG. If break 1 responses were at a ceiling, this accuracy increase could produce a spurious support for our hypothesis.

Experiment 2. A second comparison was therefore made (12 Ss in each group). The sentences were those of the first experiment with minor changes to allow a more conservative test. Sentence (1) above was changed to (2) (and similarly for other stimulus sentences):

(2) In order to wave to Harryₐ, the girlₜ pushed open the window. The positions A and B are the same serially, but now C corresponds to the minor constituent break at B in sentence (1). Under these conditions a simple increase in accuracy
should produce an increment in B, while an effect of minor structure should produce an increment at C. The results show a significant increment at C but no change (in fact, a small decrease) at B. This indicates that the results in the first experiment were not an artifact of increases in accuracy. Taken together the two experiments show that minor boundaries can affect click location under appropriate circumstances.

We are now replicating the experiment with a number of minor controls. The present research supports the view that assignment of minor constituent boundaries is a relatively late operation in the processing of sentences. Notice that this view, if it can be maintained, has the very interesting consequence that the inference of underlying grammatical relations for sentences cannot be the consequence of the development of a lowest level, detailed constituent structure for the string. Rather the inference of underlying structure relations proceeds in the absence of such an analysis. This further suggests that on-line computational difficulty of a sentence may be affected primarily by the step to underlying grammatical functions and not by the determination of detailed bracketing of the surface structure.

J. A. Fodor, M. F. Garrett

References


