Theoretical perspectives on language deficits. By Yosef Grodzinsky. Cambridge, MA: MIT Press, 1990. Pp. xviii, 192. $25.00.

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The potential of neurolinguistics was early recognized by Jakobson (1941), who offered the first modern linguistic account of the aphasias. On his account, the pattern of phonological errors present in the nonfluent, agrammatic speech of Broca's aphasia could be traced to an impairment of the temporal organization of linguistic segments into grammatical sequences. Jakobson contrasted disorders of SEQUENCING, associated with Broca's aphasia, with disorders of SELECTION, which were seen to give rise to the word-finding difficulties and fluent paragrammatisms that are symptomatic of Wernicke's aphasia. Jakobson also found parallels in the course of language breakdown and language acquisition. Partitioning the grammatical system into primary and secondary components, Jakobson advanced the Regression Hypothesis, which maintained that primary components emerged first in children and were abandoned last in aphasia. More recent linguistic descriptions of nonfluent, agrammatic aphasia have been offered, e.g. in Kean 1977 and LaPointe 1983. These accounts are also noteworthy for their attempts to show that patterns of sparing and loss in

agrammatic speech respect the natural seams of phonological theory (Kean) and morphological theory (LaPointe).

Patients with agrammatic production have been found also to experience some difficulties in comprehending spoken sentences. The discovery that agrammatism encompassed both production and comprehension led researchers, beginning with Caramazza & Zurif 1976, to the view that a syntactic deficit might be implicated. This possibility is investigated in depth in Grodinsky's book-length treatise on language breakdown in agrammatism. In this book, G ventures into uncharted territory brandishing the banner of Chomsky's Government and Binding (GB) Theory. There are clear perils involved in such an undertaking, the chief one being the temptation to marshal more theory than the data license. Potential pitfalls aside, G's book is an important contribution to the linguistic study of aphasia. It is a serious attempt to use linguistic theory to elucidate and explain central phenomena in language breakdown. In addition to specific proposals about the source of agrammatic production and comprehension, G's book is packed with interesting and provocative discussion. It is an intellectual achievement that will no doubt establish an agenda for much research on agrammatism for years to come. G puts a new spin on Jakobson's Regression Hypothesis, adapting it to a Principles and Parameters framework. All of G's proposals are explicit, clearly formulated, and testable. In this review I will begin with a brief survey of the main themes of the book. Then I will consider an instance where G seems to have overextended the theory, namely, in reformulating Jakobson's Regression Hypothesis. Finally, I wish to note some ways of subjecting G's account to further experimental scrutiny, concentrating on his putative explanation of comprehension failures by agrammatic aphasics.

First let me highlight the contents of the book. There are six chapters. Chs. 1 and 2 set the stage. Ch. 1 presents a cogent statement of the relevance of cognitive deficits for theories of human cognition. Here G sets out his views of the proper domain and scope of neurolinguistics, arguing for a partnership between theory and research findings. He attempts to secure equal status for both theory and data by focusing on one aphasic syndrome, agrammatism, and one current syntactic theory, GB. Ch. 2 outlines the aspects of syntax that form the basis of G's account of agrammatic production and comprehension. G's account utilizes a considerable amount of linguistic machinery, including (i) Binding Theory, (ii) processes that pertain to different levels of representation, D-structure and S-structure, (iii) the trace theory of movement, and (iv) Theta-theory. These and other aspects of the theory are succinctly, albeit briefly, reviewed. As noted, G views the bridge between theory and research findings as one that bears two-way traffic. Theory informs research, but in addition, data should ultimately constrain theorizing. A theory of grammar is viable, for example, only if it is learnable and parsable. To these G adds the further desideratum that an adequate theory must be 'breakdown compatible'— that is, theories are to be judged in part on their adequacy in accounting for the observed patterns of sparing and loss in the aphasias.

Ch. 3 is the centerpiece. This chapter considers the nature of agrammatic

production and comprehension failures, and how syntactic theory might accommodate them. G begins by criticizing the existing phonological, morphological, and processing accounts of agrammatic speech. Then he offers a syntactic alternative: the basic idea is that production errors occur because S-structure is underspecified. In particular, the terminal elements of nonlexical categories, such as determiners, complementizers, adverbs, and auxiliaries, are left empty, as long as the omission of material does not result in a nonword. A nonword would result, for example, if there were no zero-form corresponding to an inflected item. In such cases some inflection is inserted, but not necessarily one that shows proper agreement with other linguistic items. Data from the agrammatic speech of Russian aphasics are presented, suggesting that omissions occur whenever there is a zero-inflection option.

G also develops in Ch. 3 an account of the comprehension difficulties associated with agrammatism. Again, he begins by challenging previous proposals. He then advances his own syntactic account, which has two parts. First, he supposes that traces left behind by movement operations are deleted in agrammatism. In GB theory, relative clauses, WH-questions, and verbal passives are formed by movement; a relative clause or WH-question is the product of WH-movement, and verbal passives involve NP-movement. In all cases, a trace of the moved constituent is left behind at its site of origin at D-structure. The movement of a WH-phrase leaves behind a WH-trace. Verbal passives are formed by moving the NP in object position at D-structure to subject position at S-structure, leaving behind an NP-trace in object position. Both WH-traces and NP-traces are lost in agrammatism, on G's account. Given the ancillary assumption that traces are the bearers and transmitters of thematic roles, it follows that the thematic role of either a moved WH-phrase or a moved NP will be up for grabs. Accordingly, G hypothesizes a default heuristic strategy for assigning thematic roles to disenfranchised NPs. The first formulation of the strategy is reminiscent of Bever's 1970 Canonical Sentoid Strategy, which assigns thematic roles to NPs according to the canonical word order of a language. In SVO languages such as English, the initial NP receives the role of AGENT. In addition, some NPs continue to receive theta-roles by the usual syntactic devices; for example, an AGENT theta-role is discharged to the NP within the by-phrase of a full verbal passive. Since preserved syntactic principles work along with the nonlinguistic strategy for Theta assignment, the agrammatic representation of a verbal passive ends up projecting two AGENT NPs, in apparent violation of the Theta Criterion. Consequently, when asked to identify the agent of such a sentence, say in a picture-pointing task, the best an agrammatic aphasic can do is guess. In addition to passives, agrammatics are reported to comprehend several other constructions only at a chance level, including object-gap relative clauses. For these constructions, too, G's two basic assumptions coöperate to give the desired results (with a bit of fiddling with the heuristic strategy). Still other constructions, such as actives and adjectival passives, cannot receive a similar accounting, because they are not formed by movement, according to GB theory. Agrammatics are therefore predicted to perform at significantly above chance in responding to these constructions.
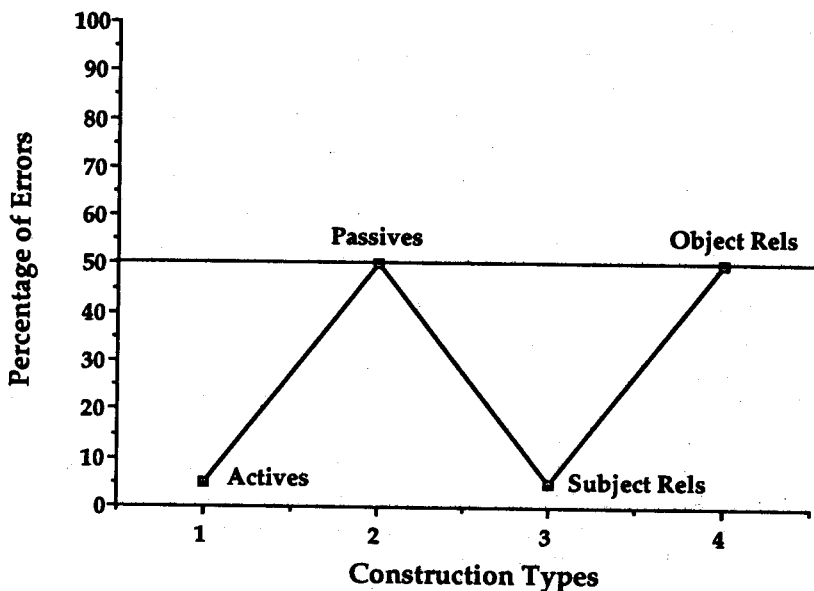
FIGURE 1.

Indeed, this prediction is borne out. Figure 1 gives a graphic depiction of the pattern of errors across construction types.

G begins Ch. 4 by confronting two competing syntactic theories, Generalized Phrase Structure Grammar and Lexical Functional Grammar. Both fail in principle, according to G, to accommodate the observed pattern of errors in agrammatic comprehension. LFG fails because it derives both verbal and adjectival passives in the same way, but handles WH-questions and relative clauses by a different mechanism entirely. GPSG is seen also to fail on the grounds that it does not divide the theoretical pie into portions corresponding to the comprehension successes and failures found in agrammatism.

Ch. 4 ends with a discussion of another theoretical division, this time within the GB camp itself. The dissension in the ranks concerns Principle B of the Binding Theory. Principle B governs coreference relations between pronouns and their potential antecedents. Chomsky's 1981 version of Principle B applies to pronouns generally; it rules out coindexation, hence coreference, between referential pronouns and nearby c-commanding NPs, as in 1. In addition, it prohibits pronouns from being bound by a quantifier, as in 2.

(1) Mama bear is washing her.
(2) Every bear is washing her.

A narrower constraint on coreference is advanced in Reinhart 1983. Reinhart's version of Principle B pertains only to bound pronouns, and says nothing about referential pronouns. On this account, 1 is anomalous because it violates a pragmatic principle, which some children apparently master late in the course of development.

As G notes, some recent findings from the literature on language development appear to favor Reinhart's view over Chomsky's (e.g. Chien & Wexler 1990). Many children between the ages of three and six accept coreference in 1—that is, they accept 1 as a description of a situation in which Mama bear is washing herself. At the same time, these children refuse to interpret the pronoun in 2 as bound by a quantifier, so they do not interpret 2 as meaning that every bear is washing herself. G uses agrammatics as another population to adjudicate between the competing versions of Principle B, and he also compares the data from aphasics and children as a way of evaluating his updated version of the Regression Hypothesis. The results are not reported until Ch. 6, however, where he modifies Jakobson's Regression Hypothesis to fit into a Principles and Parameters framework.

Ch. 5 takes a brief detour between Chs. 4 and 6, placing G's account within the broader perspective of the modularity of the language processing system, à la Fodor 1983. According to Fodor's conception of modularity, language processing is sealed off from other cognitive functions, such as reasoning and the application of real-world knowledge. These extralinguistic cognitive processes cannot influence the operations of syntactic parsing; nor can they peer into the language faculty to see what operations were executed within it. G uses this last property of modularity to wriggle out of a tight spot. Recall that he attributes only a minimal syntactic deficit to agrammatism, the deletion of traces. Other aspects of syntactic knowledge are spared. Therefore, one aspect of syntax that should remain available to agrammatics is the Theta Criterion, which guarantees the assignment of a unique thematic role to every (argument) NP. But now recall also that G's default strategy results in the assignment of the AGENT theta role to two NPs, the subject and the object in verbal passive constructions. This dual assignment is clearly a violation of the Theta Criterion. Modularity rescues G from this apparent inconsistency: he proposes that, because the default strategy is nonlinguistic, its operation is blind to syntactic principles such as the Theta Criterion. Putting the matter differently, G contends that agrammatics are forced by the modular structure of mental processing to perform irrationally, considering the extent of their preserved linguistic knowledge. Agrammatics' irrational behavior, in turn, is interpreted as support for the modularity hypothesis.

Ch. 6 presents G's reformulation of Jakobson's Regression Hypothesis. Learnability considerations loom large in G's version of the hypothesis. One consideration, which is widely accepted, is that learners do not have access to negative evidence, i.e., they do not receive input identifying which sentences are NOT in the target language. In the absence of negative evidence, learners are forced to advance from the initial state to the final state of grammatical knowledge (presumably passing through a sequence of intermediate stages) solely on the basis of positive evidence from members of their linguistic community—that is, grammatical sentences uttered in appropriate contexts. The absence of negative evidence forces learners to be conservative, so as to avoid 'subset problems'. A subset problem arises, for instance, when one setting of a parameter generates a superset of the sentences that would result from se-

lecting an alternative parameter value. Without negative evidence, something is needed to prevent learners from overshooting the target language by selecting the parameter value that generates the superset language. Otherwise, learners would not be informed of their mistake, given that the wrong parameter value permits them to generate all the sentences of the target language, and more. On this scenario, the input to language learners will always be consistent with their erroneous decision, and so they will continue to generate and accept ungrammatical sentences. As a matter of record, of course, learners uniformly succeed in converging on the target grammar. It follows that they must somehow avoid subset problems. Along with other researchers, G advocates the view that humans are innately constrained to hypothesize a progression of grammars (e.g. parameter values) that generate and accept more and more sentences. Adopting the 'Subset Principle' ensures that learners can jettison incorrect hypotheses on the basis of positive evidence alone.

We are now in position to appreciate G's revisions of Jakobson's Regression Hypothesis. Its essence remains as before—language acquisition and language dissolution take parallel but opposite courses. Since acquisition follows a Subset Principle, breakdown follows a Superset Principle. G's Superset Principle characterizes aphasia as a succession of grammatical stages, proceeding from grammars that generate large languages to ones that accept fewer and fewer sentences as well-formed.

G sees Principle B as a test case for his version of the Regression Hypothesis. He reports that agrammatic aphasics respond to sentences like 1 and 2 above in the same way that some young children do. That is, adult aphasics are willing to accept an anaphoric connection between *her* and *Mama bear* in 1, but they reject the interpretation of 2 on which the pronoun is bound by the quantifier phrase *every bear*. This pattern is seen to support G's Regression Hypothesis, but only under certain assumptions that he is reluctant to make. These assumptions concern the developmental course of Principle B. The suggestion, which G attributes to Chomsky, is that children initially limit the application of Principle B to bound pronouns, but later 'generalize' it to cover referential pronouns as well. G dismisses this scenario, however, because he favors Reinhart's alternative formulation of Principle B, which does not apply to referential pronouns even in the adult grammar. On this account, you will recall, coreference is inhibited in sentences with referential pronouns, such as 1, because of a pragmatic principle, not Principle B. G concludes, then, that what is missing in some young children and lost in agrammatism is knowledge of the relevant pragmatic principle. In conclusion, G's culminating point is that his statement of the Regression Hypothesis is 'vastly underdetermined by the available data'. Its only apparent support comes from the finding that both children and aphasics miscomprehend sentences like 1, but these failures pertain to G's Regression Hypothesis only if the data are interpreted as violations of Chomsky's version of Principle B, rather than Reinhart's. And this, G finds objectionable.

This ends my summary of G's syntactic analysis of agrammatism. It seems appropriate now to point out a couple of potential difficulties for the account. I will limit my remarks to the revised Regression Hypothesis and to the Trace

Deletion account of the comprehension failures observed in agrammatism; in both instances, it seems to me, the evidence is too thin to bear the weight of the theoretical proposals being made.

Focusing first on G's revamped Regression Hypothesis, I don't see the relevance of the findings that G cites from the literature of language acquisition and language breakdown, even if we were to accept Chomsky's version of Principle B. Here is the problem. Children's overacceptance of coreferential interpretations of sentences like 1 is evidence that their grammars initially overgenerate, not undergenerate. The hypothetical acquisition scenario that G envisions would have children first limit the coverage of Principle B to bound pronouns, and later extend it to referential pronouns as well. Notice, however, that children at the earlier stage of development would be overgenerating, not undergenerating. What G seems to have overlooked is that extending a constraint such as Principle B to apply more broadly would result in an overall REDUCTION, not an increase, in the possible interpretations allowed by the grammar. This means that, as a matter of fact, children seem to disregard the Subset Principle in mastering the constraint on the coreference possibilities for pronouns. Conversely, agrammatics, who apply coreference too liberally, have regressed in the wrong direction. They have moved from a more restricted grammar, the grammar of normal adults, to a less restricted one. This should count as a violation of G's Superset Principle, not evidence of its application. Consequently, his Regression Hypothesis is left without any empirical support. However, Jakobson's formulation of the Regression Hypothesis seems confirmed to some extent, if indeed agrammatics lose knowledge of some secondary aspect of language—namely a pragmatic principle—which children master only after knowledge of syntax has emerged.

Another aspect of G's account that seems to invoke greater theoretical machinery than the data warrant is the Trace Deletion hypothesis. To make the point, it will pay to contrast G's structurally-based account of agrammatism with one that considers the comprehension difficulties in agrammatism from a different perspective. One such account, Crain et al. 1990, develops a model of working memory that is intended to explain the comprehension failures of both dyslexic children and agrammatic aphasics. In addition to the model, several research strategies are described that can be used to distinguish a processing-limitation account of agrammatism from a structural-deficit account such as the one G proposes (see also Shankweiler et al. 1989).

First, a processing-limitation hypothesis would extend to a range of constructions beyond the purview of G's Trace Deletion account. For example, a limitation in working memory capacity would be expected to create difficulties in interpreting sentences with temporal terms like *before* and *after*, because these conjunctions sometimes introduce conflicts between the order in which clauses are mentioned and the conceptual order in which events should take place, as 3 illustrates.

(3)   Point to the star, after you point to the circle.
(4)   *The little boy fell down, didn't it?

In general, structures that require the retention of linguistic information without forewarning should pose difficulties. Another case in point is tag questions, as in 4. A finding that is consistent with this expectation comes from an important study by Linebarger et al. (1983). These authors found that many agrammatic aphasics retain the ability to perform grammaticality judgments correctly across a variety of constructions, tag questions being one of the exceptions. This finding is not easily accommodated within G's Trace Deletion account.

While on the topic of testing a variety of linguistic constructions, we should ask whether the pattern of errors that agrammatics make across constructions is amenable to a processing explanation. One way to tell is to ask normal adult subjects to respond to these sentences in circumstances that impose greater processing demands than usual. For example, subjects could be asked to perform the same picture verification task that the agrammatics did in the studies G cites, but with a concurrent distractor task, e.g. to monitor each test sentence for a target phoneme. The results that are predicted by the processing-limitation hypothesis are illustrated in Figure 2, for the same construction as Fig. 1. Since normal adults do not lack the trace of movement, this kind of pattern across sentences for adults under pressure would support a processing-limitation hypothesis, and would resist explanation on a structurally-based account.

Another way to distinguish between the competing accounts would be to use reaction-time measures of sentence difficulty. G eschews these measures on the grounds that there is no detailed theory of processing complexity; it should
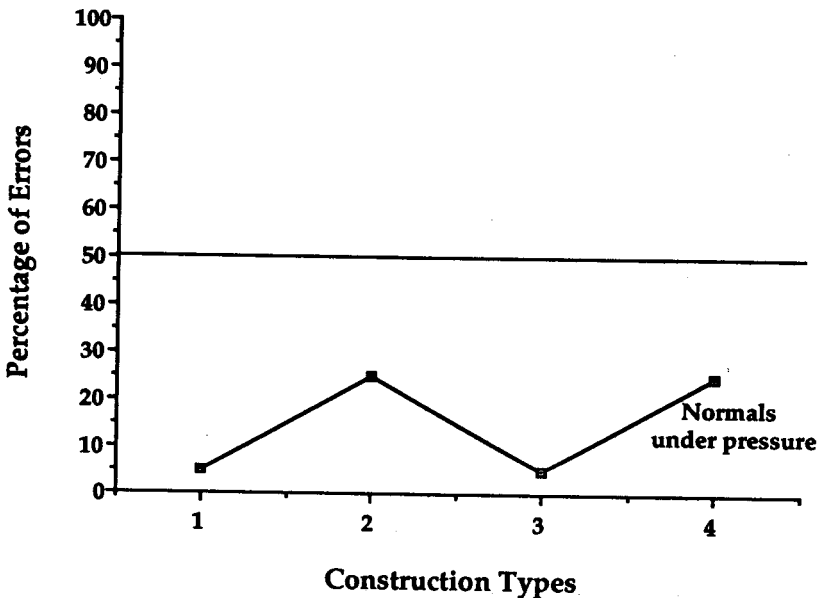

FIGURE 2.

be noted, however, that much more is known about sentence parsing than about how people parse pictures. It seems to me that we should take data where we find them. Moreover, a processing-limitation account makes an explicit prediction about the pattern of reaction-time data across subject groups. The prediction is depicted in Figure 3. In responding to different linguistic constructions, subjects who suffer from a processing limitation should show the same rank order of response times to various constructions that normals do, with the same sentences causing greater difficulty for all groups. Statistically speaking, there should be main effects among groups, but there should not be interactions of group and sentence type. Presumably, interactions would be the order of the day for a structurally-based account such as G's.

Fig. 3 also underlines the value of the use of control groups to investigate structural versus processing accounts of agrammatism. On a processing-limitation account, other populations with special limitations in working memory would be expected to show the same patterns of responses as agrammatics. For example, dyslexic children are known to suffer from an impairment in verbal working memory. It is also well established, in my view, that their syntactic knowledge is equal to that of age-matched normal readers. If working memory is the common denominator, then it should turn out that dyslexic children present the same picture as agrammatics in their comprehension of many linguistic constructions.

To conclude, G has offered an account of agrammatism that is genuinely theory-based. It is both provocative and testable. While in full agreement with G's view that viable accounts of language disorders will be both theory-based
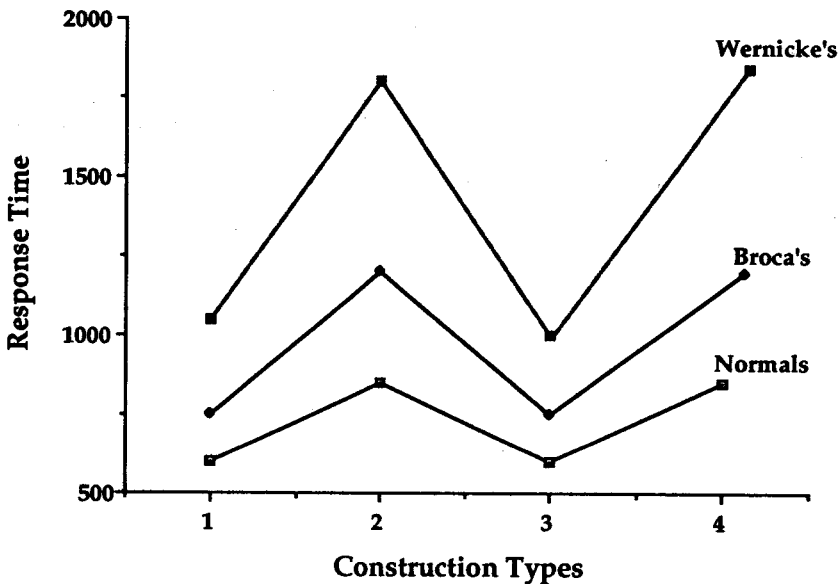

FIGURE 3.

and testable, I have expressed some reservations about the adequacy of the structurally-based account of agrammatic comprehension that G proposes, I have sketched an alternative approach and suggested some strategies for pitting a structural account against one based on processing limitations. Only time will tell which story is closer to the truth. At all events, G is to be commended for his attempt to wield linguistic theory in charting a new course of research in the study of language breakdown.

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