

Linguistic Society of America

Linguists, Psychologists, and the Cognitive Sciences

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Source: *Language*, Vol. 66, No. 2 (Jun., 1990), pp. 317-322

Published by: [Linguistic Society of America](#)

Stable URL: <http://www.jstor.org/stable/414889>

Accessed: 02/12/2014 07:06

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DISCUSSION NOTE

Linguists, Psychologists, and the Cognitive Sciences

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Under the guise of a book review, Stephen R. Anderson (1989) has written a thoughtful critique of attempts by linguists and psychologists to collaborate in a venture called cognitive science. The general thrust of Anderson's argument is that psychologists ignore linguistic discoveries when building their theories of cognition and, evenhandedly, that linguists have neglected to explain the implications of their discoveries in a form that psychologists could appreciate. As one who has frequently worked in the cracks between these two disciplines, I am moved to add my own perspectives on the issues that Anderson raises.

The problem of interdisciplinary communication has been around a long time, but not until the late 1970s did it command everyone's attention. A philanthropic program conceived by Kenneth Klivington and adopted by the Alfred P. Sloan Foundation offered financial support for something that they called cognitive science. Since the offer presupposed a unitary science of cognition, interested parties were financially motivated to create one. Many interdisciplinary conferences followed.

I once described one of those conferences as follows (Miller 1986:279):

'In 1978 at one of the more memorable meetings a group of distinguished supplicants was asked to summarize the state of cognitive science at that time, and thereupon the fable of the blind men and the elephant was reenacted. No one had a broad view of cognitive science. Everyone knew his or her own field and had heard of two or three interesting findings in other fields. After hours of discussion, experts in discipline X grew unwilling to make any judgments about discipline Y. In the end, they did what they were competent to do: each summarized his or her own field, and the editors patched together a report with bandaids (Keyser, Miller, & Walker 1978).'

As a consequence of the Sloan Foundation's initiative, many linguists and psychologists are now much better acquainted than they were fifteen years ago and the collocation 'cognitive science' has grown sufficiently familiar that many have forgotten how recently it designated an experiment, not a branch of science. But many participants in this experiment still prefer, when being careful, to speak of the cognitive sciences, using the plural. Their position seems to be that a unified cognitive science may someday be possible, but today it is premature. Others doubt that it will ever be possible: the psychologist Daniel Osherson and the linguist Thomas Wasow once published an article arguing that integration is impossible, that psychological processes and linguistic structures would never submit to a single analysis (Osherson & Wasow 1976).

The original players in the Sloan program were supposed to be artificial intelligence and cognitive psychology, and it is clear that AI and psychology have continued to work well together: the Psychology Department at Carnegie

Mellon University illustrates how that game is played. But officers of the Sloan Foundation listened to advisors who persuaded them to add linguistics to the inner circle. (The outer circle included anthropology, neuroscience, and philosophy.) In retrospect, a case could be made that that was bad advice, that linguistics has not contributed to the common cause. Anderson seems to accept that opinion when he writes that many linguists 'have focused more on the potential value of the tools provided by generative grammar for studying language (and languages) than on its potential role in uncovering the structure of the mind' (809).

But linguists are not supposed to uncover the structure of the mind. No prudent psychologist would argue with Gazdar, Klein, Pullum, & Sag (1985) when they say that 'it is possible, and arguably proper, for a linguist (qua linguist) to ignore matters of psychology.'¹ Surely, the nature of linguistics and linguistic theories are questions for linguists to answer. But can linguists ignore all matters of psychology and still claim membership in the Cognitive Science Society? Anderson acknowledges certain advantages for linguists in retaining their status as cognitive scientists—better that than being 'sent back to the narrowly humanist ghetto from which the field managed to emerge in the 1960s' (809). But other cognitive scientists, he feels, do not take linguistics seriously. He describes linguistic hypotheses that deserve attention, yet seem to be ignored or neglected. Psychologists, in particular, do not rush to absorb them—perhaps because they see no way to test them experimentally—and linguists do not rush to explain their cognitive implications, perhaps because they shudder at the thought of being taken for psychologists.

It is an interesting argument, and by choosing examples carefully I can almost persuade myself that there is truth in it. But when I try to summarize it with the generalization that things are no better now than they were in 1978, I suddenly realize that something is seriously wrong. Anderson is describing a local aberration, not a general condition.

The nearest thing we have to a definition of cognitive science in 1989 is the recent handbook, *Foundations of cognitive science*, edited by Michael I. Posner (1989). When I compare the 1989 summary to our initial attempt (Keyser, Miller, & Walker 1978), the progress made in one decade is simply astounding. I note in particular that linguistics is well represented in these pages. Chapter 5 is a review of grammatical theory written by Thomas Wasow; Chapter 6 is a review of model-theoretic semantics by Jon Barwise and John Etchemendy; Chapter 9 is a review of language acquisition by Steven Pinker; Chapter 10 is a review of research on reading by Alexander Pollatsek and Keith Rayner; Chapter 11 is a review of research on discourse by Barbara J. Grosz, Martha E. Pollack, and Candace L. Sidner. This is not the place to review all the cases where the thinking of these logicians, psychologists, and computer scientists has been enriched by their knowledge of linguistics generally, and of the theory of grammar specifically. Skeptical readers will simply have to survey these

¹ It is significant that such declarations of independence are considered necessary. Should psychologists be equally explicit that it is proper for a psychologist, qua psychologist, to ignore matters of linguistics?

pages for themselves: I believe it would be difficult to read these chapters attentively and come away with the opinion that cognitive scientists have not paid attention to linguistics.

Is the reverse true? Have linguists paid sufficient attention to logic, psychology, and computer science? Clearly, linguists have not neglected logic—from rewriting rules and logical form to Montague grammar, many logical issues have preoccupied linguists. As for computer science, the distinction between syntactic theory and parsing is now clear to everyone, computational linguistics has become respectable, and some grammarians (e.g. Gazdar et al. 1985) have devoted considerable attention to the computability of their proposals.

Psychology seems to be the exception. Of course, one could argue that studies of the biological bases of language that were initiated by psychologists have not been totally ignored by proponents of nativism in linguistics, or that psychological research into learnability has not been totally ignored by proponents of Universal Grammar, or that psychological research into lexical memory has not been totally ignored by grammarians who have emphasized the role of the lexicon in syntax. Yet a feeling of disappointment persists. For example, when Wasow (1989:197) writes that ‘the asymmetry between sophisticated competence theories and fairly rudimentary performance theories has had the effect of insulating linguistic theory from decisive testing for psychological reality,’ he seems to have in mind exactly the sort of problems Anderson has raised.

It should be emphasized that this asymmetry is a local mismatch. The larger picture is much healthier. But the local mismatch cannot be brushed lightly aside, because it is most severe precisely where linguists have the greatest investment—in the study of syntax.

Unfortunately, in order to pursue Anderson’s arguments in detail, it is necessary to consider the specific book that he took as the occasion for his essay: Philip N. Johnson-Laird’s introductory textbook, *The computer and the mind: An introduction to cognitive science*. It is unfortunate because, although the issues are interesting, in order to raise them in the pages of *Language* he had to write an unfair review. Anderson focuses on 80 pages of a 400-page book and, because he had larger game in mind, he overreaches. In the end, the review of the book says little more than that Johnson-Laird should have written the book that Anderson had in mind, not the one that Johnson-Laird had in mind. Anderson, for example, would have used Chomsky’s critique of behaviorism to show that connectionism is in principle inadequate for the description of language and so, presumably, cannot be considered a plausible mechanism for any kind of cognitive process; Johnson-Laird, being less confident about what these novel devices might ultimately be able to compute, settled instead for a text that would prepare a beginning student for what cognitive scientists are actually doing. Anderson would have used Universal Grammar to display the structure of the mind; Johnson-Laird felt more comfortable taking computability as his integrating thread. Anderson would have given far more detailed descriptions of linguistic structures; Johnson-Laird, apparently more mindful of the extent to which structuralists underestimate the role of context, was unwilling to ignore the communicative function of language. The book that

Anderson would have written would make good reading, but I doubt that it could serve as an introduction to anything but the study of language. Since we have numerous introductions to linguistics but few attempts to introduce beginning students to the much broader field of the cognitive sciences, I would not burn Johnson-Laird's book in order to have Anderson's.

It is true that much of what interests Anderson most about language is not mentioned in *The computer and the mind*. Section V of the book is written as if English were the only language, with unfortunate consequences. English-specific ideas about logogens and perceptual cohorts are introduced as if they represented cognitive universals. Morphology is not discussed, for no persuasive demonstration of the importance of morphology could be based solely on English. Recent work in phonetics and phonology is ignored. An idiosyncratic notion that truth conditions are essential to linguistic semantics is given undeserved attention. And so on. From his catalogue of Johnson-Laird's omissions Anderson draws the general conclusion that 'the psychologists (as well as those in some other fields, including much of the Artificial Intelligence community) have simply not been doing their homework' (810).

I have tried for forty years to persuade psychologists to do their linguistic homework (Miller 1990), and I welcome Anderson's assistance in this crusade. I am glad to note that there are now a few converts, psychologists who do follow the linguistic literature closely and make good use of it. It is regrettable that Anderson's irritation with Johnson-Laird's book led him to denounce all psychologists as unrepentant functionalists, interested only in the communication of meaning in English. But he is still right when he says that psychologists who are interested in cognition should know more about linguistics. It is also true that linguists who are interested in cognition should know more about psychology. I take such conclusions to be corollaries of the banal observation that everybody should know more about everything.

The more interesting issues that Anderson raises are not specific to this book, for they would be equally appropriate in a discussion of Johnson-Laird's earlier book, *Mental models* (1983), where language and linguistics are discussed in far greater detail. Nor are they specific to Johnson-Laird, or to psychologists generally. Thomas Wasow is no psychologist, yet most of Anderson's catalogue of omissions would apply equally well to Wasow's review chapter in Posner's *Foundations of cognitive science*.

Anderson seems to hold a singular conception of how linguists should advance our understanding of the human mind. Yet Anderson and Wasow agree that linguistics has something important to contribute: Anderson concludes his review with the claim that linguistics constitutes 'just about the ONLY cognitive system for which we can say we have something like a formal and explicit theory of its structure, function, and course of development in the organism' (810); Wasow concludes his chapter with a similar claim, that linguistics 'has provided the most elaborate and detailed proposals in existence regarding the nature and structure of one mental faculty' (1989:198). Yet the fact that Wasow fails to discuss many of the topics that Anderson considers most relevant for

cognitive science indicates that they must have different ideas about the cognitive implications of these formal, explicit, elaborate, and detailed proposals.

I cannot imagine an adequate psychological account of human mental life without linguistic competence playing a central role. It is also an article of faith that the linguistic competence that psychologists need to understand is the same competence that linguists are interested in—the facts to be explained are the same for both. Why, then, should serious linguists and psychologists have these problems of emphasis and perspective that Anderson's review uncovers?

Some have answered this question in terms of the competence-performance distinction: linguists and psychologists talk about different things. It is certainly true that grammarians are more interested in what could be said than in what people actually say, which irritates psychologists, and that psychologists insist on supplementing intuition with objective evidence, which irritates linguists. But these are precisely the differences that patient collaboration should overcome. Others have answered this question in terms of the structure-function distinction: linguists and psychologists ask different questions of the same thing. Again, there is some validity to the observation. Linguists, for example, are interested primarily in characterizing membership in grammatically defined sets, whereas psychologists are preoccupied with the cognitive processes whereby those entities are produced or interpreted. But nowhere is it written that structure and function must be unrelated. Anatomy and physiology complement one another in biological theories; structural and functional accounts of language should eventually do the same. In my opinion, neither the competence-performance distinction nor the structure-function distinction, for all the problems they cause, can be blamed for the issues that Anderson identifies.

So where is the snag? What is holding up the free flow of ideas back and forth between linguists and psychologists? For what it is worth, my own view is that linguists and psychologists subscribe to different theories of explanation. Linguists tend to accept simplifications as explanations. For example, a grammarian who can replace language-specific rewriting rules with X-bar theory and lexicalization feels he has explained something: the work formerly done by a vast array of specific rules can now be done with a simple schema. For a psychologist, on the other hand, an explanation is something phrased in terms of cause and effect, antecedent and subsequent, stimulus and response. To an experimental psychologist, X-bar theory is not an explanation; rather, if it is true, it is something to be explained. There is a preference for explanations in terms of learning, of course, because psychologists think they know something about learning; genetic explanations of cognitive processes are still pie in the sky.

If I am right about this, the remarkable thing is that linguists and psychologists have accomplished as much together as they have. For some reason, the two styles of explanation clash most strongly in discussions of syntax: interdisciplinary collaboration in the study of syntax will not be as productive as it should be until psychologists learn to accept simplifying explanations. (Part of this conversion will depend on having persuasive ways to decide which of two

different but equally powerful simplifications is to be preferred.) But until simplification can be seen as a clear step toward causal laws—a halfway house, so to speak, on the road to causal explanation—the average psychologist, like the average layperson, will remain skeptical of the grammarian's claims of scientific progress.

If Anderson actually does accept his own challenge to linguists to write books about cognitive science that make clear the central role of linguistics, I predict that one of the most difficult aspects of the project will be to make clear to psychologists that simplifying explanations can be satisfying, once you grow accustomed to them. I sincerely hope that Anderson undertakes such a book, and I look forward with great interest to his integration of the full range of cognitive processes in terms of the generative principles of universal grammar.

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[Received 2 January 1990;
accepted 3 January 1990.]