FOUNDATIONS of LANGUAGE

Brain, Meaning, Grammar, Evolution

'The most important book in the sciences of language to have
appeared in many years.' **Steven Pinker**

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to our students

Preface

I began my graduate work at MIT in 1965, at a time when generative linguistics was very much the toast of the intellectual world. Everyone from biologists to philosophers to literary critics wanted to know about deep structure in syntax and what it showed us about the mind and human nature. Over the succeeding decades, generative linguistics has certainly flourished. But the price of success seems to have been increasing specialization and fragmentation within the field, coupled with a gradual loss of prestige and influence in the outside world. In the course of those years, I found my own interests slowly drifting away from the mainstream. Yet, unlike most people who have undergone such a shift, I still consider myself a generative linguist.

The reason for this self-assessment, even if it seems paradoxical to some of my colleagues, is that the overarching goals of generative linguistics still resonate strongly for me and guide my inquiry. A vast amount of research since 1965 has enabled us to refine, nuance, and enrich those goals, but nothing has come along that to me justifies rejecting them in favor of something else.

After many years toiling in the terra incognita of lexical semantics, with detours into musical cognition and the theory of consciousness, I returned during the 1990s to syntax, where I had begun my life as a linguist. From the perspective gained in the interim, it struck me that some traditional basic assumptions about the overall roles of syntax and the lexicon in the grammar were mistaken. In 1965 these assumptions looked altogether reasonable. Without them it is unlikely that the field could have progressed with the exuberance it did. However, as such things often do, these assumptions first hardened into dogma and then disappeared into the background, there to be maintained through the many subsequent incarnations of transformational generative syntax: the Extended Standard Theory, Principles and Parameters Theory (more or less alias Government-Binding Theory), and the Minimalist Program.

The first difficulty in confronting these assumptions was bringing them back to the foreground so they could be examined and questioned. The second difficulty was deciding what to put in their place. Fortunately, many of the necessary pieces were already to be found among the numerous non-transformational approaches to generative grammar that developed during the 1980s and 1990s, such as Lexical-Functional Grammar, Head-Driven Phrase Structure Grammar,

Autosegmental Phonology, Autolexical Syntax, Role and Reference Grammar, Construction Grammar, and Optimality Theory. Important pieces of the model also came from the generative music theory that I had developed with Fred Lerdahl in the late 1970s.

To my surprise, the effect of these revisions is a rather radical reformulation of linguistic theory that in some strange sense "turns the grammar inside out." The new framework above all preserves what I consider the genuine insights of generative grammar. But at the same time, it permits us to see more clearly the proper interaction among the various subdomains of grammar, as well the virtues of the various approaches to grammatical theory on the market. To me, it therefore offers the hope of restoring some degree of much-needed unity to the field of linguistics.

In exploring where I thought traditional assumptions of generative grammar had led linguistics astray, I also discovered real scientific reasons (beyond the all too numerous personal and political ones) for the gradual distancing of linguistics from much of the rest of cognitive (neuro)science. And, although my reformulation of grammar was motivated largely on grounds internal to linguistics, it turned out also to permit much more fruitful interactions with research in language processing, language acquisition, language use, spatial cognition, social cognition, evolutionary psychology, and neuroscience. If anything, these interactions have proven to be the most exciting aspect of the enterprise, for to me they revive the promise of the generative linguistics of my intellectual childhood: that the study of linguistic structure can provide an entrée into the complexities of mind and brain. Not the only one by any means, but one with unique insights to offer.

The goal of the present book, therefore, is to present an overview of the new landscape and an exploration of some of the roads through it. I have written it with three concentric audiences in mind. The most central, of course, is linguists of all specialties and all persuasions. The next ring includes those disciplines that look to linguistics for theoretical models: psycholinguistics, neurolinguistics, language acquisition, and computational linguistics. The outer ring includes everyone else who has some professional concern with language, including psychologists, cognitive scientists, neuroscientists, philosophers of language and philosophers of mind, perhaps evolutionary biologists. Naturally I also welcome anyone else who wishes to join in the conversation.

Unfortunately, the reaction of some linguists to foundational discussion of the sort I engage in here is: "Do I (and my students) really have to think about this? I just want to be able to do good syntax (or phonology or whatever)." I acknowledge that, as the field has grown and matured, some degree of specialization is inevitable and necessary. Still: when you're driving you don't just look

ten feet in front of the car. You continually shift your gaze back and forth from near to middle to far distance. Once in a while you may even look around and enjoy the scenery. So it should be in scientific research as well. One has both the goal of understanding the problem at hand and the goal of integrating it into the larger context. And if integration seems to call for alteration of the larger context, one should not shrink from the challenge.

In order for such integration to succeed, probably everyone will have to endure some discomfort and give a little. We cannot afford the strategy that regrettably seems endemic in the cognitive sciences: one discovers a new tool, decides it is the only tool needed, and, in an act of academic (and funding) territoriality, loudly proclaims the superiority of this tool over all others. My own attitude is that we are in this together. It is going to take us lots of tools to understand language. We should try to appreciate exactly what each of the tools we have is good for, and to recognize when new and as yet undiscovered tools are necessary.

This is not to advocate a warm fuzzy embrace of every new approach that appears on the scene. Rather, what is called for is an open-mindedness to insights from whatever quarter, a willingness to recognize tensions among apparently competing insights, and a joint commitment to fight fair in the interests of deeper understanding. To my mind, that's what the game of science is about.

A book with a scope this large is well beyond the scholarly capabilities of any single individual. My empirical research for the last thirty-five years has concentrated on semantics and its relation to syntax, and this is what I have the most to say about here. If I have slighted other areas, from phonetics to typology to acquisition to pragmatics, it is not because I don't think these areas are interesting enough. It is just that I can only venture into them with trepidation, relying on (or against the advice of) friends whom I trust. For years the relevant literature has been expanding far faster than anyone can read it. Life is short. Readers who find my treatment woefully incomplete in their areas of interest are hereby invited to write more chapters.

Because I aspire to speak to so many different audiences here, I sometimes have found it necessary to make technical remarks that are more pertinent and more accessible to one audience rather than another. Rather than flag such passages as, say, "only for linguists" or "mostly for philosophers," I have chosen to trust readers to decide for themselves how to read the book.

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As we have a long and tortuous path to travel, I owe the reader some hints of where we are going.

Part I lays out the fundamental issues that motivate generative linguistics.

First, in the interests of recognizing what a theory of language is responsible for, Chapter 1 is devoted to briefly presenting the structure associated with a very simple sentence of English—a wealth of structure that is well established independent of any doctrinal considerations. We then discuss three basic tenets of generative linguistics that I think have stood the test of time: mentalism, combinatoriality, and nativism.

Mentalism (Chapter 2): Language is instantiated in the minds and therefore the brains of language users, so that linguistics is to be regarded as a branch of psychology. We will ask what it means to say linguists are modeling the mind, and we will reinterpret in a more tractable light the important distinction between competence and performance, i.e. between speakers' knowledge of a language and their ability to put that knowledge to use.

Combinatoriality (Chapter 3): One of the most striking features of language is the fact that speakers can understand and construct an indefinitely large number of sentences that they have never experienced before. This leads to the conclusion that a speaker's knowledge is instantiated as a set of generative principles (or rules) for constructing and recognizing sentences; these principles constitute the speaker's mental grammar. After enumerating some of the general types of rule proposed in various frameworks of generative grammar, we will discuss some problems that combinatoriality poses for popular theories of semantic memory and neural nets.

Nativism (Chapter 4): Children obviously learn language through exposure to the environment. However, Chomsky's most famous and controversial hypothesis is that the child brings resources to language learning beyond those used for other sorts of learning: he claims that the ability to learn language is in part a cognitive specialization of our species, a "Universal Grammar" that is "wired into" children's brains.

How should this hypothesis be construed, and how can it be verified? How could the genetic code produce such "wiring," and what role could evolution have played in it? While acknowledging certain criticisms, on balance I will conclude that a suitably nuanced version of the Universal Grammar hypothesis is supportable, and that it should continue to play the central role in linguistic investigation that it has enjoyed since *Aspects*.

Part II is the point where we diverge from standard generative theory. Chapters 5 and 6 are the theoretical core of the book; they expose the traditional assumptions that I find mistaken and develop alternatives.

The role of syntax (Chapter 5): Traditional generative grammar assumes without argument that only syntax is "generative," that is, that the combinatorial complexity of language arises entirely by virtue of its syntactic organization. I will motivate a framework in which phonology, syntax, and semantics are

equally generative. Syntax is thus only one of several parallel sources of grammatical organization. The generative components communicate with each other through "interface" components; we will spend considerable time showing that these interfaces are of nontrivial complexity. We will also see that many of the alternative frameworks for generative grammar share this sort of parallel organization.

The lexicon (Chapter 6): Traditional generative grammar makes a pair of related assumptions: first, that lexical items—the stored elements that are combined into larger expressions—enter the combinatorial system by virtue of being inserted into syntactic structures; and second, that lexical items are always words. In the parallel model of Chapter 5, lexical items emerge instead as parts of the interfaces among generative components. Moreover, by taking very seriously the question of what is stored in memory, we will arrive at the view that lexical (i.e. stored) items are of heterogeneous sizes, from affixes to idioms and more abstract structures.

This reconceptualization of the lexicon leads to striking consequences for linguistic theory, in particular breaking down some of the traditional distinction between lexical items and rules of grammar. It also leads to a reconsideration of the formal character of language learning.

Language processing (Chapter 7): The parallel model lends itself rather naturally to addressing issues of language perception and production. In particular, the interface components, including the lexicon, can be interpreted as playing a direct role in language processing. It develops that the notion of modularity is no longer to be couched in terms of an isolated "grammar box," but rather in terms of time constraints on the interaction of the multiple components of the language processor. This view, motivated here in terms of linguistic theory, has in fact emerged independently on experimental grounds within the psycholinguistic community. Thus it seems within reach to integrate the theories of competence and performance much more fully than has been previously possible.

Evolution (Chapter 8): One of the issues raised by the nativist claim is that the capacity to learn language must have emerged at some point in the evolution of the human species. However, it is difficult to see how a capacity of the complexity usually assumed by linguists could have evolved through natural selection. It turns out that the parallel model offers more attractive possibilities for an incremental evolution of the language capacity. We will discuss some possible stages in this evolution, showing how they are reflected in the organization of present-day language.

A glaring lacuna in most approaches to generative grammar has been the absence of a theory of semantics of any sophistication. Part III is devoted to working out the foundations of semantics in a manner compatible with the

goals of generative linguistics, incorporating insofar as possible the insights of several (largely incompatible) approaches, including traditional philosophy of language, logic and formal semantics, lexical semantics of various stripes, cognitive grammar, psycholinguistic and neurolinguistic approaches, and my own conceptual semantics and related work.

Mentalism again (Chapter 9): We begin by couching the questions of semantic theory in mentalistic terms, so that semantics will be compatible with generative grammar. We contrast this position with a number of other views of what semantics is about. This chapter also addresses the putative distinction between linguistic meaning and "world knowledge," arguing that various ways of making this distinction do not serve the purpose they are intended for. Rather, if there is a special "linguistic semantics," it is the theory of the interface components between meaning and linguistic expression.

Reference and truth (Chapter 10): The most difficult challenge to a mentalist semantics is the overwhelming intuition that language refers to objects and events "in the world." A direct connection between a language in the mind and objects in the world is severely problematic. I conclude that the proper formulation of reference is as a relation between linguistic expressions and the world *as conceptualized by the language user*. Such a formulation aligns with standard views in perceptual psychology, and permits a far richer ontology of entities for language to refer to than most formal semanticists and philosophers of mind are accustomed to grant. Some of the standard philosophical objections to this view are answered; at the same time, some of the standard puzzles of reference are shown to dissolve.

After these two chapters that lay the groundwork, the final two chapters are devoted to lexical and phrasal semantics respectively. Chapter 11 addresses the issue of lexical decomposition, showing that, although traditional decomposition into necessary and sufficient conditions is not viable, the evidence warrants a far richer notion of lexical decomposition. Chapter 12 develops a theory of phrasal composition, again considerably richer than usually assumed. In particular, the meaning of a sentence consists of more than the meanings of its words combined according to syntactic structure. I motivate separating phrasal and sentential semantics into a number of *tiers*, along the lines of phonological tiers, each of which contributes a different sort of information to the meaning.

Finally, a brief epilogue attempts to pull everything together.

Acknowledgments

The opportunity to write this book arose from an invitation to spend the academic year 1999–2000 at the Wissenschaftskolleg zu Berlin, a research institute whose only purpose is to invite people from many different fields to come, do their work, and talk with one another. And a glorious year it proved to be. Ensconced with my computer in a villa in Grunewald, I went at it day after day, month after month, till a draft was done in June, just in time to pack up and come home. What sustained me was the amenities: the lovely lunches and dinners with colleagues and staff, the weekly colloquia, many many nights at the opera, and the multidimensional fascinations of the city. The staff of the Kolleg was overwhelmingly warm and helpful, and I was privileged to have as friends especially Christine von Arnim, Andrea Friedrich, Reinhart Meyer-Kalkus, Katharina Biegger, Barbara Sanders, and Maria Wirth, and to have as Boss the incredible Wolf Lepenies.

Among my cohort at the Kolleg, David Olson, Angela Friederici, and very particularly Merrill Garrett were valuable sources of discussion and advice on matters pertaining to the book. David Wasserstein, Valentina Sandu-Dediu and Dan Dediu, Fania and Eli Salzberger, Elizabeth Dunn, Barbara Brown, Franco Moretti, Niki Lacey, and Marcello deCecco were constant good companions. My life outside the Kolleg was fortified by frequent excursions to the dives of Kreuzberg, guided by Kai Reimers and the jolly Wiese sisters, Heike and Karen. Cantor Oljean Ingster, Rabbi Chaim Rozwaski, Irene Runge, and the regulars of the Rykestrasse Synagoge took me in as one of their own and introduced me to the richness of Jewish life in Berlin.

During the preceding summer I had the chance to offer a course at the LSA Linguistic Institute at the University of Illinois, based on my plans for the book. To my astonishment, the class kept growing as the course went on; I guess they liked it. I am grateful to the director of the Institute, Adele Goldberg, for making all the arrangements for the course so smooth, and to Gert Webelhuth, Dan Jurafsky, Jila Ghomeshi, Beth Jacobs, and numerous members of my class—as well as Adele again—for many lively discussions of relevant issues.

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Contents

PART II ARCHITECTURAL FOUNDATIONS