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BOOK REVIEW

Language is Not an Instinct

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Pinker, S. (1994). *The Language Instinct: How the Mind Creates Language.* New York: William Morrow.

Generative Grammar came to the attention of psychologists by way of its trenchant critique of behaviorist theories of language acquisition and use, and indeed that critique played an important role in the cognitive revolution (Chomsky, 1959). But along with Generative Grammar—hiding under its coattails, so to speak—came a curious brand of nativism (Chomsky, 1968). What was most curious from the point of view of psychologists was that in arguing for his linguistic nativism, Chomsky did not rely on behavioral observations of the type conventional in the scientific study of human behavior and cognition. Instead he relied exclusively on logical arguments, most importantly his "proof" that grammars based solely on sequential associations could not account for many natural language phenomena and his argument that in principle abstract syntax could not be learned by observing particular instances of language use (argument from the poverty of the stimulus).

As Generative Grammar has evolved over the years, its practitioners have begun to bolster their arguments for linguistic nativism by making reference to a variety of empirical phenomena, often extending nativistic hypotheses to aspects of language structure that were not a part of Chomsky's original logical arguments. For example, there have been well-publicized investigations of deaf children who create their own languages, people with defective grammar genes, linguistic "savants," children "creating" creole languages, and selective language deficits in aphasic persons. These phenomena have been described publicly in a variety of different fora, both popular and scientific. However, their popular reporting often

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contains egregious inaccuracies, and their scientific reporting is often inaccessible to nonlinguists due to the technical jargon of Generative Grammar.

In his new book, *The Language Instinct: How the Mind Creates Language,* (1994) Steven Pinker attempts to remedy this situation. Pinker devotes much of his book to summarizing and explicating the recent extensions of Chomsky's theory. More ambitiously, he also attempts to bring together all of these extensions into a single coherent argument for linguistic nativism that does not require a deep understanding of the technical apparatus of Generative Grammar. The book is sure to be widely read as it is aimed at a general audience and has received broad popular exposure from a number of Book-of-the-Month club listings and reviews in such publications as *People* magazine and *USA Today*. It is a spirited and lively account, entertainingly written, and all people who study language for a living can be thankful to Pinker for introducing the public to our peculiar passion in a form in which they might actually read and understand it. In particular, the book does a wonderfully irreverent job of distinguishing the descriptive study of language, which is what scientists do, from the prescriptions of the self-appointed linguistic police who decry the degeneration of language from the presence of slang, "nonstandard" dialects, and other varieties of normal linguistic usage and change.

The problem with the book is that Generative Grammar and its concomitant nativism are presented to the reader as established scientific facts, without even the hint of a hint that there are fierce theoretical and empirical debates currently raging over almost every issue discussed. That many linguists, indeed the majority of linguists, do not believe in a Chomsky-like Universal Grammar is not acknowledged anywhere in the 430 pages of the book. Thus, Pinker simply states in the introductory chapter that he is going to introduce the reader to "the science of language," which contrasts only with the confused and uninformed views of laypersons and humanists. He goes on to state that in the science of language it has been discovered that language is a "distinct piece of the biological makeup of our brains . . . a specialized skill . . . distinct from more general abilities to process information or behave intelligently" (p. 18). We are told that although some linguists prefer other terms, Pinker prefers to capture this discovery by saying quite simply that humans have an instinct for language in much the same way that spiders have an instinct for spinning webs. He then proceeds to report a dizzying mélange of research that has led linguists to the "discovery" that language is an instinct.

But language is not an instinct. In the common understanding of both scientists and laypersons alike an instinct is a behavioral competency, or set of behavioral competencies, that: (a) is relatively stereotyped in its behavioral expression, and (b) would appear in ontogeny even if an individual

were raised in isolation from its species-typical set of experiences (e.g., Birney & Teevan, 1961). But language does not even remotely fit with either of these two criteria. "Language" has several thousand distinct variants in the human species that are fundamentally different from one another, including in their syntactic conventions, and an individual human being can acquire any one particular language only in the context of several years of particular types of linguistic experiences with other human beings. Why, then, has Pinker chosen to apply the term instinct in such a clearly inappropriate manner? The answer is that what Pinker and his fellow Chomskyans mean by the term "language" is not what is normally meant by that term. They do not mean the communicative conventions of the speakers of particular languages such as English, Turkish, or Warlpiri. What they mean is something called Universal Grammar, which is the supposedly species-universal computational structure of language that is, in their view, wholly unlearnable (ironically, the central thesis of Learnability Theory).

In this brief essay I argue three things. First, I argue that although many people bandy about rather loosely the notion of an innate language module, the only theoretically coherent version of such a module that has ever been proposed is that of Generative Grammar—in which resides *a priori* the theoretically-specific linguistic structures of Universal Grammar. This and only this is Pinker's "language instinct." Second, I argue that this view of language and its development, though coherent, is wrong. All of the most important lines of evidence that Pinker's new book adduces for an innate Universal Grammar are also compatible with a less rigidly nativistic view of language acquisition in which there is a biological foundation for language, just not in the form of specific linguistic structures preformed in the human genome. Finally, I argue that there is an alternative linguistic theory, or group of theories, that should be especially attractive to cognitive developmentalists because they are much more compatible with what is known about development in other domains of human cognition.

WHAT IS INNATE?

Although on anyone's account there are a number of ways in which human beings are biologically prepared for language—for example, with a basic set of cognitive and communicative competencies along with a vocal-auditory apparatus specialized for the processing of speech—these have nothing to do with Universal Grammar. Universal Grammar is a construct that is specific to the theory of language known as Generative Grammar. I will thus call Pinker's hypothesis the Generative Grammar As Instinct hypothesis so as to keep its theoretically specific nature clearly in the foreground.

To assess this hypothesis, there are three things that developmental psychologists should know about Generative Grammar. The first is that Generative Grammar takes as its model of natural language formal languages such as mathematics and propositional logic. From this original metaphor, everything else in the theory flows. Most important, in formal languages the distinction between syntax and semantics is absolute and rigorously maintained because the whole purpose of formal languages is to allow users to manipulate abstract symbols in algorithmic ways without regard for their meaning or interpretation. Generative Grammar thus rigorously maintains the same distinction: The autonomy of syntax is its paradigm-defining postulate (Lakoff, 1990), and it is not concerned in any way with the conceptual or pragmatic aspects of language understanding and use—only with syntax (Chomsky, 1980). Because of their abstractness, formal languages may be applied to basically any behavioral or cognitive domain, and thus in addition to generative grammars for language, generative grammars have been written for such diverse phenomena as dreaming, genetics, and music (e.g., Collado-Vides, 1991; Foulkes, 1978; Jackendoff, 1983).

Flowing also from this mathematical approach to language is the fundamental goal of Generative Grammar to formally describe "all and only the grammatical sentences of a language," and to do so in the most mathematically elegant manner possible (so-called explanatory adequacy; Chomsky, 1965). There is thus no distinction between a theory that attempts to describe language in the most formally elegant or efficient terms, and one that attempts to describe language as it is manifest in human behavior; that is, there is no distinction analogous to that made in Artificial Intelligence research between expert systems (built to work) and human simulations (built to be psychologically plausible). Consequently, in Generative Grammar new formalizations that increase the mathematical elegance of the theory are automatically assumed to be a part of the Generative Grammar Instinct, with no empirical verification necessary (Chomsky, 1986).

The second thing developmentalists should know about Generative Grammar is that when its particular form of combinatorial mathematics was first applied to natural language it was applied to English only. This historical fact has had a significant role in shaping the theory and has led to, for example, its excessive concern for the serial ordering of linguistic constituents (which has very little syntactic significance in many of the world's languages), its excessive concern with transformations and movement rules (which do not even make sense for some languages; see section on language universals), and its excessive concern with some syntactic categories such as sentence "subject" (which are not present in some languages; see section on language universals). Over the years, Generative Grammar has finally conceded that it should deal with languages other than English, and thus the theory of principles and parameters was created (Chomsky, 1981; 1986). In

this theory, the innate syntax module contains a common *bauplan* for all languages, but there is also a small set of optional parameters, each with a delimited range of settings, that are configured differently for different languages. For example, all languages have sentence subjects, but some, such as English, express them in free-standing words while others, such as Spanish, have the option of expressing them in small endings on verbs. The appearance of variability among different languages is thus an illusion in Generative Grammar; underneath they are all the same.

The third thing developmentalists should know about Generative Grammar is that the ontogentic development of language is an illusion as well. Chomsky (1986) puts it this way:

> Irrespective of questions of maturation, order of presentation, or selective availability of evidence, the result of language acquisition is as if it were instantaneous; in particular, intermediate states attained do not change the principles available for the interpretation of data at later states in a way that affects the state attained. (pp. 53–54)

Language structures are not learned, but they are present innately and are only "triggered" by linguistic "input." For example, a person learning English does not learn or construct or acquire the notion of sentence subject, but must only discover that in English the innately known notion of sentence subject is indicated by word order, and in this way form a connection between English and the innate module (Pinker, 1984). The reason there cannot be development in this theory is that its mathematical approach yields from the outset structures that are characterized as abstract and unchanging Platonic forms (Tomasello, 1992a).

So what exactly is innate on the Generative Grammar As Instinct hypothesis? In orthodox Chomskyan theory (Government and Binding theory; Chomsky, 1981), the list contains things that no nonlinguist would ever recognize—such things as the projection principle, the empty category principle, the subjacency constraint, and the coordinate structure constraint. Pinker's list is a bit more recognizable. He outlines a list of four basic features that he believes are present in all languages, whatever their specific parameter settings, and so presumably constitutive of the innate language module. These are: (a) phrase structure rules (in the form of X-bar syntax "trees") specifying both the hierarchical organization of elements in sentences and the grammatical relations of subject and object (or their modern equivalents); (b) long-range dependency relations that determine which elements can "move" to which places in the sentence while still preserving grammaticality (i.e., transformations or movement rules and their modern sequelae such as the subjacency constraint and the empty category principle); (c) closed-class elements (i.e., grammatical morphemes) that operate

in sentences with respect to such things as tense, aspect, modality, case, and negation; and (4) lexical categories such as noun and verb.

It is these and only these types of structures that constitute the innate computational structure of language in the Generative Grammar As Instinct hypothesis. What is common to all of them are two things. First, they are all inherently "syntactic" in nature: they do not depend on meaning or on the particular grammatical conventions of particular languages, and the form they take is mainly driven by considerations of mathematical elegance (especially movement rules, which are in many ways the defining feature of Generative Grammar). Although it is undoubtedly true that Pinker and others whose allegiance to Generative Grammar is somewhat generic are not concerned with mathematical elegance per se, it is still the case that the linguistic phenomena they take as self evident—for example, X-bar theory and movement rules—are phenomena that could only be generated by a theory that *is* concerned with mathematical elegance. Second, all of these universals are described in linguistically specific terms such that it is very difficult to relate them to cognition in other psychological domains (what Bates, 1984a, calls a "scorched earth" policy in which unintelligibility to other disciplines is considered a virtue). Thus, in this view, noun and verb have nothing to do with concepts of object and action, but are defined solely in terms of their syntactic distributions; subject of a sentence has nothing to do with topic of discourse or focus of attention, but is defined as the syntactic node that is hierarchically superior to all others in the sentence; and the hierarchical arrangement of words into phrases has nothing to do with hierarchical organization as it is manifest in many other domains of human cognition.

Many linguists do not agree with the language universals posited by Chomsky and Pinker (see subsequent discussion), and so for them these structures could not be a part of any innate language module. This does not mean, as Pinker sometimes implies, that they view language as something other than a biological phenomenon; it only means that they view the biological preparation for language in something other than Generative Grammar terms. Although each may have some specific views of language universals, it would probably not be upsetting to any of these dissenting linguists to hypothesize that children come to language acquisition equipped with such things as (a) the capacity to perceive and conceptualize objects, actions, and properties; (b) the capacity to acquire symbols for these and other experiential entities through interactions with mature language users; (c) the capacity to construct categories of symbols; (d) the capacity to combine into a single utterance symbols and categories of symbols and to symbolically mark them for the roles they play in these combinations; (e) the capacity to construct abstract symbolic schemas and templates (constructions); (f) and the capacity to discriminate and produce

a variety of language-relevant sound patterns. Perhaps languages rest on this more general type of biological foundation.

The issue, then, is not whether human beings are biologically prepared for language acquisition; they are. The issue is whether human beings come into the world equipped with an innate linguistic module that contains from the outset adult linguistic structures of the Generative Grammar kind. Pinker believes that they do, and he believes that there are a number of lines of empirical evidence that support the Generative Grammar As Instinct hypothesis.

WHAT IS THE EVIDENCE?

Pinker's main arguments for the Generative Grammar As Instinct hypothesis fall into five broad categories: (a) arguments that language broadly defined is a species universal and species specific characteristic of human beings; (b) arguments that some specific Generative Grammar structures are universal; (c) modularity arguments involving such things as specific language impairments, linguistic "savants," and brain localization; (d) arguments that a number of language acquisition phenomena cannot be explained by traditional learning mechanisms; and (e) arguments that the acquisition of language in some special circumstances can only be explained by the existence of a Generative Grammar instinct. Obviously, in this brief forum I cannot hope to do justice to all of the subtleties of argumentation that each of these lines of investigation requires. My attempt will be only to suggest in each case that there are reasonable alternative interpretations of the data that do not require the positing of an innate Generative Grammar module.

Species Universality and Specificity

Pinker begins with the very general observations that every human culture has a language and that no group of nonhuman animals has a language. Both true. But the fact that all cultures have a language does not mean that the basic structures of language are innate. As Bates (1984a, in press; Bates, Thal & Marchman, 1991) has argued repeatedly, species universality does not imply specifically linguistic genes. Universality is just as consistent with a view in which human beings all over the world are faced with similar communicative problems and have similar cognitive and physical resources with which to solve them. Bates' (1984a) well-known analogy is that all human beings eat mostly with their hands, but that does not mean that there is an eating-with-the-hands gene.

Nor does the fact that only human beings learn to speak a language argue for its innateness. There are many species-specific behaviors that are nevertheless learned by individuals, for example, only humans cook their

food but that is presumably not the result of a cooking gene. The fact that no apes or any other nonhuman animals have evolved a fully human language, and do not seem to be able to acquire one even with extensive human tutelage, implies to Pinker that there is a fundamental difference between humans and apes. There is. But the simple fact that apes do not have a language does not by itself specify the nature of that difference. There are many differences between apes and humans that might account for apes' limited successes in language acquisition (e.g., Tomasello, 1994—which, by the way, are less limited than previously believed (Savage-Rumbaugh, Murphy, Sevcik, Brakke, Williams, & Rumbaugh, 1993).[1]

To repeat: language is grounded in the human genome as are all other human competencies. But species-universality and -specificity does not tell us about the nature of this grounding; for example, whether there is an innate syntax module containing adult structures from the outset, or whether instead human beings begin life with a set of more general cognitive and cultural learning capacities that create language structures during ontogeny.

Language Universals

Pinker's arguments rely heavily on the supposed universality of some linguistic structures. The problem is that arguments about language universals are very difficult because they typically involve a plethora of technical linguistic issues. I will do my best to avoid them, instead referring readers to some appropriate sources for the full arguments.

The basic point is this. Generative Grammar was created to describe English. Many of the same Generative Grammar structures that are found in English can be found in other languages—if it is generative grammarians who are doing the looking. But these structures may not be found by linguists of other theoretical persuasions because the structures are defined differently, or not recognized at all, in other linguistic theories. Conversely, other theories may identify universals that Generative Grammar does not recognize. The point is that there are no theory-neutral structures in linguistics, and thus universality is a totally theory-dependent phenomenon. Nevertheless, Pinker's claims about language universals, and some possible difficulties, are as follows:

1. Pinker claims that the X-bar version of phrase structure syntax is universal in human languages. However, there are certain types of

[1]It should also be mentioned in this context that in his attempt to describe naturally occurring systems of animal communication so as to highlight their remoteness from human language, Pinker leaves out of account what is arguably the most humanlike case: chimpanzee gestural communication (e.g., Tomasello, Call, Olguin, Nagell, & Carpenter, 1994).

languages that do not fit well with X-bar syntax. For example, nonconfigurational languages such as Dyirbal (a native Australian language) stretch the rules considerably (Dixon, 1972), and the language Lakhota (a native American language) has no coherent verb phrase at all (Van Valin, 1993).

2. Pinker claims that the grammatical relations of subject and object are universal. But there are some languages that show no evidence of these grammatical relations, for example, Acehnese (an Indonesian language; Durie, 1985) and Tagalog (a Philippine language; Maratsos, 1989). If the evidence is viewed in a nondoctrinaire fashion, these languages seem to operate with very concrete linguistic categories such as "agent," "topic," and "actor."
3. Pinker claims that various phenomena of long-range "movement" are universal. But for most of the world's languages the whole concept of movement is decidedly inappropriate because when its speakers do such things as form questions they simply substitute a question word for the questioned element, leaving all else in the utterance essentially unchanged (e.g., Mandarin Chinese and Lakhota). Even in English the explanation for "movement" is not uncontroversial; for example, Van Valin (1991, 1993) has given an explanation of the subjacency constraint in terms of the pragmatics of discourse.[2]
4. It is true, as Pinker claims, that many of the world's languages have grammatical morphemes expressing such things as tense, aspect, modality, case, and negation. But which ones of these notions particular languages grammaticalize, and how they do so, shows much cross-linguistic variability (Talmy, 1988), with languages such as Mandarin Chinese having very little grammatical morphology at all. The near universality of many of these grammatical morphemes most likely results from the facts that humans need to express some notions repeatedly and that when a notion is expressed repeatedly in a language, there is a tendency for it to become "grammaticalized" (Heine, Claudi, & Hünnemeyer, 1991).

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[2]If one doubts whether indeed real people formulate questions by transforming a declarative sentence, the familiar response of Chomskyans is that you are mistaking a competence model for a performance model—movement is not meant as a psychological process but is simply used to depict the interrelations of certain grammatical structures. But as Chomsky before him, Pinker treats movement as psychologically real when it is convenient to do so. Thus, on page 279, he describes question formation as follows: "For example, to assemble the "simple" question *What did he eat?*, based on *He ate what*, one must move the *what* to the beginning of the sentence, leaving a trace that indicates its semantic role of "thing eaten," insert the meaningless auxiliary *do*, make sure that the *do* is in the tense appropriate to the verb, in this case *did*, convert the verb to the infinitive form *eat*, and invert the position of subject and auxiliary for the normal *He did* to the interrogative *Did he*."

5. Among the best candidates for universality are, as Pinker claims, the word classes of noun and verb. But even in this case, it is not totally clear that all languages have English-like categories (Maratsos, 1988). Moreover, Braine (1987) argues that noun and verb are most likely reflections of the more basic cognitive distinction between predicate and argument, and Langacker (1987b) argues that they derive from the cognitive categories of object and process.

This brief discussion of language universals is decidedly inadequate. I have neither the space nor the expertise to give these questions the attention they deserve. But the view of Van Valin (1993) and many other linguists is that Generative Grammar is built on the model of English—which is in many ways a very peculiar language since it relies so heavily on word order and so little on morphology to express basic syntactic relations—and that Generative Grammar simply forces other languages into this Procrustean bed without an appreciation for how they work in their own right. When non–Indo-European languages are taken as the starting point for linguistic theory, a very different view of language universals emerges (the interested reader is encouraged to consult Foley & Van Valin, 1984, and Van Valin, 1993). In the view of many linguists language universals are very likely the result of the facts that all groups of human beings cognize the world in similar ways, have similar communicative goals, and share the common medium of the linearly-based vocal-auditory speech channel (Bates, in press).[3]

Modularity

Under the general heading of modularity, we may group four of Pinker's specific arguments: language is structured differently than other areas of human cognition; some people have genetic defects leading to very specific language deficits; some people have cognitive deficits that leave language, or at least syntax, relatively untouched; and language functions are located in specific parts of the brain.

Uniqueness of Language Structures. One argument for the modularity of syntax is that syntactic structures are not like the structures observed

[3]It should also be noted that, despite Pinker's arguments to the contrary, it is possible that language universals reflect a common origin for all modern languages. Although this hypothesis may be unlikely, it is not ridiculous given the paucity of hard evidence and the current controversies on the origin of *homo sapiens sapiens* in the relatively recent evolutionary past. Certainly Pinker's speculation that language arose several million years ago—a circumstance necessary to give evolution enough time to craft all of the complexities of modern language as Chomskyans describe it—is not shared by any non-Chomskyan theorists I know of (see Noble & Davidson, 1991.)

in other cognitive domains: there is nothing quite like inflectional morphology elsewhere in human cognition (Chomsky, 1968). But this fact does not imply that there is an innate syntax module. The game of chess also has many unique structures: there is nothing quite like a knight fork or a queen-side attack elsewhere in human cognition. But no one believes that this uniqueness requires an innate chess-playing module (Bates et al., 1991). The cognitive structures that mature individuals use in playing the game of chess derive ontogenetically from a process in which individuals apply general cognitive processes to the problems that are presented to them in the course of learning to play the culturally constructed game.

Specific Language Impairments. Some human beings have language impairments, for either known or unknown reasons, that can be quite specific in their effects. This has been taken by some to imply that there are specific genes dedicated to specific language structures. The most celebrated case in the recent literature is the British family made popular by Gopnik and Crago (1991). Many members of this family (perhaps in a Mendelian pattern) show a difficulty with grammatical morphology, for example, plurals and past tense endings. Some scientists have taken this to mean that the grammatical morphology component of the Generative Grammar module is genetically determined. The problem is that the afflicted members of the family have a serious expressive problem with their speech in general (Fletcher, 1990; Vargha-Khadem & Passingham, 1990), and moreover, all of their documented deficits are in linguistic production not comprehension (Marchman, 1993). These facts raise the possibility that the linguistic problems of this family may concern linguistic expression and not linguistic understanding per se. It is significant in this regard, and to his credit, that even Pinker himself does not believe that the evidence supports the view that members of this family have a defective grammar gene. His hypothesis instead is that the expression of some nonlanguage genes is interfering with normal language functions in these individuals. The point is that neither this case, nor any other I am aware of, provides evidence that there are grammar genes that code for specific aspects of language structure.

Linguistic "Savants." One of the most widely used pieces of evidence for the autonomy of and innateness of syntax is persons who have low IQ scores, but produce complex grammatical sentences nonetheless: so-called linguistic savants. The reasoning is that IQ is a measure of general intelligence and if people with low intelligence still produce complex sentences, then the ability to produce complex sentences must be independent of general cognition. Leaving aside the fact that no serious student of the cognition-language relation believes that IQ tests measure the aspects of

cognition that underlie language, let us look at the main cases Pinker proffers.[4]

The most celebrated cases of linguistic savants are reported by Cromer (1991) and Yamada (1981). These subjects both had low IQs, but relatively normal syntactic skills. Even granting that IQ tests are useful in this context, it must be recalled that IQ is a number derived by dividing a number based on a person's raw score on an IQ test (so-called mental age) by their chronological age. And despite their low IQ scores, Cromer's and Yamada's subjects were teenagers who had mental ages equal to that of 4 to 6 year old children—who, as Pinker argues in other places, have practically adult-level linguistic skills![5]

The other case Pinker cites is Williams syndrome children, whose language skills seem to be more like those of typical children than their other cognitive skills. The most important point in this case is that these children are nowhere near as cognitively deficient as Pinker makes them out to be. He lists all kinds of simple tasks that "they" cannot do, but his list is actually a compilation of all of the idiosyncratic deficiencies that different researchers have found in a large sample of these children. No one child has them all, or even a majority of them. Conversely, the language of Williams syndrome children is far from normal. In the data of Bellugi, Wang, and Jernigan (1994), for example, the complex syntax of Williams syndrome teenagers is equivalent to that of typically developing children at 7 years of age. Indeed, some recent research suggests that the language of Williams syndrome children is actually quite predictable from their mental age, and thus they have language skills indistinguishable from those of retarded children in general (Gosch, Städing, & Pankau, 1994). Williams syndrome children have been portrayed as so proficient in language mainly because they are typically compared with IQ-matched Down syndrome children, whose language is lower than would be expected based on their mental ages (Dykens, Hodapp, & Evans, in press)—and perhaps because their articulation is so clear and they produce more lengthy stereotypic phrases (Gosch et al).

But suppose there do turn out to be linguistic "savants." What does that mean? Haukioja (1993) considers the case of another type of savant, the

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[4]In a related argument, Pinker thinks it is important that all of the world's known languages have equally complex forms of linguistic structure, even the languages of modern peoples whom he erroneously calls "Stone Age people" (p. 25). The argument is that language complexity is independent of cultural variations of cognitive and intellectual complexity since these "Stone Age people" are supposedly not intellectually complex. But this is a bogus argument because we have no reason to believe that these people are cognitively less complex than ourselves in any ways that matter for language; literacy, formal education, and Western science are not the basic processes of cognition that underlie human language.

[5]I thank Elizabeth Bates for pointing this out to me.

so-called "date-calculators." These are persons who have low IQs and often lack even the most basic arithmetic skills as traditionally tested and displayed, yet they are able to calculate the day of the week for a given date millennia into the past or future. Should we conclude that date calculation is independent of cognition and even mathematical skills? Would it not be more reasonable to suppose that these individuals have the capacity to display their cognitive and mathematical abilities in some ways but not in others?

Brain Localization. We do not know much about which parts of the brain are responsible for the language abilities of linguistic "savants" or the disabilities of language-impaired persons. There are other sources of knowledge of language-brain relationships, however, including such things as the study of persons with various types of aphasia and the use of the new imaging techniques that are sensitive to the metabolic activity of different parts of the brain as it does its work. But even using these techniques our knowledge of which parts of the brain deal with which aspects of language comprehension and use is far from perfect. Indeed, the more we know about the brain the more we find that strict localization of language functions is not the case (Bates, in press). It is now well known, and Pinker documents, that there is significant variation in the human population with respect to the localization of language functions in the brain, with a fair proportion of left-handed individuals showing atypical localization patterns, and that brain damaged children quite often develop language functions in atypical portions of the brain. Suffice it to say that after a tour of the brain and a mass of evidence for various aspects of localization of various language functions, Pinker admits: "But to be honest, no one knows what either Broca's area or Wernicke's area is for" (p. 311).

It is also important to note in this connection that even if there were strict localization of specific language functions across all members of the human population, this would not imply anything about the Generative Grammar As Instinct hypothesis. Many hypotheses could explain localization; for example, Bever (1994) has hypothesized that certain aspects of language processing require a certain level of complexity of brain function (e.g., for dealing with relational concepts), and that certain parts of the brain are good with complex material of whatever type. And even if a specific part of the brain dealt only with language, it still might be the case that that part of the brain is used for the *learning* of language. The general point is that brain localization implies basically nothing about the origins of a cognitive function (Bates, in press).

Summary. Appeals to the brain have a certain cachet in psychological circles because they appeal to "hard science." But arguments about local-

ization in the brain, selective deficits, and islands of competence in children and adults, are basically irrelevant to the issue of whether there is an innate syntax module. This point is made most clearly by the recent theoretical work of Greenfield (1991) and Karmiloff-Smith (1992) who argue, each in their own way, that there may very well be modularity of specific cognitive functions in adulthood, but that this may result from the channeling of cognitive resources into particular functional domains during ontogeny. Modularity is very often the result of developmental processes, not their cause. In this view, instead of being seen as an innate encapsulated module already containing its adult structures, language may be seen as "a new machine made out of old parts" that becomes modularized and localized in the brain as ontogeny proceeds (Bates, 1979).

Language Acquisition

Pinker's use of language acquisition as support for his Generative Grammar As Instinct hypothesis invokes two interrelated theoretical arguments: the poverty of the stimulus and the insufficiency of general learning procedures when applied to language. Chomsky has made each of these arguments previously, but Pinker supplements the logical arguments with new data.

Poverty of the Stimulus. It is important to recognize that poverty of the stimulus arguments are not meant to apply to the conventions of language that people actually learn and control. Thus, there is no poverty of information when children are exposed to and learn the specific words or specific syntactic conventions of the language they are acquiring. The examples used to illustrate the poverty of the stimulus argument always have to do with some grammatical mistakes that children might "logically" make on the basis of "simple induction" and the like, but do not (see Chomsky, 1986, pp. 7–12). Because children have been given no evidence that these mistakes are indeed mistakes, they must be avoiding them on the basis of an innate knowledge of language structure.

In making the poverty of the stimulus argument, Pinker cites two empirical studies: Crain (1991) and Stromswold (1990). Crain (1991) found that children do not make certain kinds of errors that they might "logically" make if they used some simple-minded question-formation procedures (ergo, they possess innate knowledge). Thus, they do not say such things as "Is the man who running is bald?" based on a simple rule like "To form a question move the first verb in the corresponding declarative sentence [i.e., the sentence "The man who is running is bald"] to the front"—which works in some simple cases such as forming the question "Is the man bald?" from "The man is bald." But who says that such a rule is simple or natural to children, or even that children form questions from declarative

sentences at all? There are many straightforward reasons for why children would not say "Is the man who running is bald?" such as: they have never before heard the word *who* followed by an *-ing* verb form. It should also be pointed out that in his commentary Slobin (1991) notes that the performance of children in Crain's tasks can plausibly be explained in every case by their use of semantic and pragmatic strategies (rather than by their application of innate linguistic knowledge).

Stromswold (1990) also reports a number of mistakes that children do not make. Again, she begins by positing that some mistakes would be natural if children operate on simple inductive procedures. Thus, on analogy with the pair "I like going" and "He likes going" children might be expected to say "I am going" and "He ams going." But in almost every such case that Pinker cites (p. 272), the supposed analogy is between a main verb form (such as *like*) and an auxiliary (such as *am* in *am going*). The former is from the open class of main verbs which might be expected to generate analogies among its members (as it does when children overregularize things such as the past tense), but as an auxiliary the latter is not from a coherent word class at all and thus analogies to other words or word classes are not to be expected. The overall point is that, as in the case of language universals, we are once again deeply embedded in theory: which errors children might be expected to make under which hypotheses depends totally on the investigator's theoretically motivated decisions as to what is the appropriate linguistic level on which analogies are made. If children's analogizing is not based on abstract linguistic symbols but rather on concrete words and semantically based classes of words, then we would never expect the errors that Generative Grammarians hypothesize as "logical."

Pinker also cites approvingly in this context a study by Gordon (1986), which accords with some of his hypotheses about the innate distinction between regular and irregular grammatical morphology (Pinker, 1991). In this study children were asked to make certain kinds of plurals out of compound words. If children were told that an animal that eats a single mouse is a "mouse-eater," they responded that an animal that eats many mice is a "mice-eater." But children did not like to do the same thing with "rat-eater"; "rats-eater" is just too strange-sounding and so they do not make that mistake. The difference, in Pinker's view, is that *mouse* forms its plural in an irregular fashion, and *rat* forms its plural in a regular fashion. Because children supposedly do not receive the kind of linguistic examples they would need to distinguish different kinds of plural formation with compound words, this rule is supposed to be innate in some form, that is, the two types of plural formation are separate processes in an innate morphology module (a submodule of the Generative Grammar module). A simple alternative explanation, however, is that children have learned during ontogeny to put the plural *-s* on the end of words only, and they

therefore will not put the plural *-s* in the middle of words, even in compounds (Van Valin, cited in Kemmerer, in press).

In general, Pinker thinks it is important that children do not make large numbers of grammatical "errors" even though they receive no "negative evidence" about the grammaticality of the utterances they produce. In some very particular sense it is true that parents do not routinely engage their children in grammar lessons. But there are any number of ways that parents respond differentially to their children's conventional and unconventional utterances, for example, choosing more often to repeat grammatical utterances but to recast into conventional adult form ungrammatical utterances (Bohannon & Stanowicz, 1989; Farrar, 1992). In general, children get all kinds of feedback about the communicative effectiveness of their linguistic productions each and every time they speak, which bears at least some relation to their grammatical conventionality—especially if grammar is conceived less formalistically than in Generative Grammar.

Insufficiency of Traditional Learning Processes. Underlying all of these examples and analyses is the issue of the learning processes that children employ in language acquisition. In all cases Pinker invokes Chomsky's (1959) analysis, with a few twists, supposedly showing that general learning procedures are not sufficient for language acquisition. But the procedures Chomsky and Pinker show to be insufficient are simply a worn-out mix of behaviorist learning theory, simple association, and blind induction—the infamous trio of straw men left over from the 1950s. A more thoroughly cognitive learning theory, invoking complex processes of pattern extraction leading to category and schema formation (but still leaving room in some cases for the individuality of particular lexical items), may very well be up to the job (see next section). It is not a possibility that Pinker considers.

Summary. None of these arguments for the necessity of an innate syntax module in language ontogeny is a strong one. The fact is that there are many reasons for why children make some grammatical "errors" but not others (Bowerman, 1982), and for why regular and irregular grammatical morphology may show different patterns of learning and use in development (Chandler, 1993). The errors that some theoreticians consider "logical," and so marvel at children's avoiding, may not be logical from the child's point of view at all—they are simply theoretically derived analogies that children would never think of making. The fact that simple-minded processes of association and induction cannot account for language acquisition does not mean that a more cognitively and functionally sophisticated cognitive-developmental theory cannot do so.

Acquisition in Special Circumstances

In addition to the poverty of the stimulus arguments associated with typical language development, Pinker also discusses cases of language acquisition in which the language learning environments of particular children are seriously impoverished.

Pidgins and Creoles. Following Bickerton (1984), Pinker claims that the existence and structure of creole languages provides support for linguistic nativism. The situation is this: In some cultural situations, people who speak different languages come together in specific activities and must create a common means of communication. What often results is a pidgin language, which lacks many of the syntactic features of natural languages. It is supposedly the case that some children have grown up exposed almost totally to pidgin languages, but they end up speaking a creole language, which is based on the pidgin but adds in many of the syntactic structures it is missing. The idea is that the children must have supplemented their impoverished "input" with syntactic structures from their innate language "bioprogram."

The commentaries to Bickerton's (1984) paper, however, make it clear that the language-learning situations of these children are not well known. They all occurred in the relatively distant past (in Bickerton's case of the creoles of Hawaii, 70–100 years ago), so what the children heard is uncertain. The adult pidgin speakers by definition all had dominant languages that they used in some contexts (e.g., when speaking to other native speakers of their dominant language), and it is unclear to what extent the children heard these languages. Maratsos (1984) points out that a number of linguistic entities in the creole data Bickerton reports could *only* have come from one of the dominant natural language from which the pidgins derived, and Samarin (1984) and Seuren (1984) point out a number of facts about the demographics of pidgins and creoles showing that the children in question had much more exposure to natural languages than Bickerton has supposed. The case for children supplementing impoverished "input" cannot be made until we know what the "input" was.[6]

Sign Languages. Also relevant in the context of poverty of the stimulus arguments is the "home-sign" invented by Goldin-Meadow's remarkable children (e.g., 1984), whom Pinker inexplicably does not cite. These are deaf children whose parents do not believe in teaching them a conven-

[6]Perhaps because he is aware of this problem, Pinker cites in addition two other case studies of children growing up in unusual linguistic circumstances. But neither case has been reported in the scientific literature and undergone its critical scrutiny.

tional sign language, and so the children and their parents have developed idiosyncratic signing practices. Similar to the pidgin-creole example, as they are learning "home-sign" the children supposedly add some syntactic features that are not in their mothers' signing—presumably from an innate syntax module. However, notwithstanding the fact that what these children are doing is indeed amazing and attests to the remarkable creativity of human beings in the domain of communication, it is not clear that what they are doing implies an innate syntax module. In her commentary to Goldin-Meadow's (1984) monograph, Bates (1984b) points out many of the interpretive problems involved in assigning formal syntactic descriptions to idiosyncratic forms of communication. For example, Goldin-Meadow takes as evidence of a complex recursive sentence a gesture string such as "Susan/WAVE/Susan/CLOSE," but Bates points out that it might just be two simple sign duos concatenated and not recursively related.

Also important in this context are Petitto's (1988) subjects learning a conventional sign language. Petitto has documented an important difference in the "natural" gestures of these individuals and their truly linguistic signs in American Sign Language (ASL). For example, as do hearing children, deaf children learn to point "naturally." But they also learn to point in ASL as symbols in this linguistic system (e.g., for *me* and *you*). Deaf children differentiate these two different types of pointing in several ways right from the beginning; for example, making reversal errors with *me* and *you* as ASL symbols. Pinker takes this to mean that there is something purely linguistic, and presumably innate, about the knowledge underlying ASL but not "natural" pointing. Just as likely, however, is that these children learn both an indexical form of pointing—probably ritualized from some natural behavior such as reaching or directing the self to objects—and a symbolic form of pointing for ASL—most likely learned from observation of others using the ASL pointing symbol. This difference of learning process and resulting gesture type would very naturally lead to a number of differences in patterns of learning and use (Tomasello, in press). This difference in gesture types is a truly fascinating difference that says much about human creativity and symbolic skills, but it does not say anything about an innate language or syntax module.

Summary. There is no question that language acquisition is a robust and well-canalized developmental phenomenon. Human children acquire basic skills of linguistic competence in a wide variety of circumstances. But this robustness by itself does not tell us the nature of the developmental mechanisms involved. Walking is a developmental function perhaps even more heavily canalized than language, but recent research has shown that it is not controlled by a specific genetic program that specifies muscles movements or other specific components of walking itself; rather, walking

in humans develops as infants marshall a variety of resources, each of which has its own developmental history, in the service of a behavioral goal, given the constraints of the human skeletal and muscular system (Thelen, 1984, 1989).

WHAT IS THE ALTERNATIVE?

Although one would not know it from the writings of the generative grammarians, there are alternative theories of language that begin from a very different set of premises about its nature. Of most importance are linguists who characterize what they do as Cognitive Linguistics—for example, Langacker (1987a, 1992), Lakoff (1987, 1990), Talmy (1988), and Croft (1991)—and those who characterize what they do as Functional Linguistics—for example, Van Valin (1993), Bates and MacWhinney (1982, 1989), and Fillmore (1988). These linguists have built their theories not on the analogy to consciously-created formal languages, but rather on the basis of psychologically meaningful constructs such as symbols, categories, schemas, frames, images, discourse perspectives, and the like. The theories are thus not driven by considerations of mathematical elegance, but rather by considerations of psychological plausibility.

To understand these theories, we must begin by defining language differently. Of special importance is the distinction between syntax and semantics. Because Generative Grammar treats natural languages as formal languages, syntax and semantics are fundamentally opposed (see earlier discussion). Approaches to natural language that do not take formal languages as their model look at human communication and language very differently. Thus, in Cognitive and Functional approaches it is argued that the whole opposition between syntax and semantics as characterized by Generative Grammar is completely wrong-headed. In these approaches, all language structures are symbolic instruments that serve to convey meaning, from the smallest morphemes to the most complex syntactic devices. The major opposition in language is *not* between syntax and semantics, but between linguistic symbols and their meanings: signifiers and signifieds, forms and functions, symbols and meanings. Within the signifier/form/symbol pole, we may then distinguish between different types of linguistic signs, for example, lexical, morphological, and syntactic. Within the signified/function/meaning pole we may distinguish between semantic and pragmatic functions. Nothing could be more fundamental to an understanding of language than how things are divided up at the outset (Langacker, 1987a).

For Cognitive and Functional linguists, the creativity of language comes from the tendency of human beings to create *categories* in their language, as they do in other areas of cognition. These categories may be regularly

combined in a certain pattern in a given language, leading to the formation of certain typical sentence or discourse *schemas* (e.g., see Van Valin, 1993, on syntactic "templates"; Langacker, 1987a, on sentence "schemas"; and Fillmore, 1988, on grammatical "constructions"). Thus, "Colorless green ideas sleep furiously" has an eerily grammatical sound to mature speakers of English not because syntax is separate from semantics, but because in English the semantics of the verb *sleep* creates a schematic structure in which the preverbal slot contains the sleeper, the words *colorless* and *green* canonically modify nouns (and thus the whole phrase "colorless green ideas" is interpreted as the sleeper), the word *furiously* canonically modifies verbs, and so forth and so on. Thus, after some point in development individuals sense that Chomsky's famous nonsense is in some sense grammatical because they possess an intransitive sentence schema involving the grammatical categories of noun (and noun phrase), adjective, verb, and adverb.

With regard to language phylogeny, the Cognitive/Functional view sees language universals as resulting from human cognitive and social universals and the way languages have evolved. All groups of human beings have certain experiences they wish to communicate to others and have evolved the ability to use conventional symbols to do so. All groups of human beings have the ability to categorize these symbols and form combinations of them, and to extract schematic patterns of those combinations involving hierarchical organization. All groups of human beings engage in certain forms of social interaction and attention directing. All groups of human beings have the same vocal-auditory channel, which requires them to communicate their experiences by expressing symbols linearly, one at a time. Given these "constraints," all groups of human beings have at their disposal some combination of four and only four linguistic devices for communicating experience: individual symbols (lexical items), markers on symbols (grammatical morphology), ordering patterns of symbols (word order), and prosodic variations of speech (e.g., stress, intonation) (Bates & MacWhinney, 1982). Different languages have evolved different ways of using these four linguistic devices in the service of specific communicative functions specific to the culture, and the evolution of particular languages show a very interesting interplay between the "choices" that are made (Slobin, 1985). Thus, for example, as English has lost much of its grammatical morphology for marking the basic "who did what to whom" of a sentence, word order has come to serve that function, becoming much more rigid as a result. In other languages word order is basically free, and the "who-did-what-to-whom" is conveyed by special word endings, or even prosody in some tone languages, with word order confined to pragmatic functions exclusively (e.g., for stress and topic maintenance). The main point is that in the Cognitive/Functional approach to language some uni-

versals are expected because all languages are used by human beings who share basic cognitive resources, social-communicative goals, and channels of communication. Differences among languages are expected because of the complex histories of different peoples with their changing communicative needs.

With regard to language ontogeny, the Cognitive/Functional view sees no evidence to support the view that hidden underneath children's initial, rather humble communicative attempts are the abstract, adult-like structures of Generative Grammar. Children acquire the communicative conventions of those around them gradually, over a period of years, and they do so using a wide variety of their developing cognitive and social-cognitive skills. In learning their first words children employ their basic abilities to form concepts, to follow into the attention of adults, and to reproduce new words in their appropriate communicative contexts (Tomasello, 1992b). Children's first word combinations typically have a frame-and-slot schematic form, relying an adult verbs or "pivots" such as *kiss* or *gone* (Braine, 1976). These early structures depend on children's conceptualizations of events (e.g., kissing) and their identification of discrete participant roles in these events (e.g., the "kisser" and the "kissee"). In their earliest combinations, however, children do nothing to symbolically mark the different participant roles. When they do begin to mark these roles (e.g., in English with the contrastive use of word order and prepositions), they do so on an event-specific basis; the grammatical markers used for one event or verb do not generalize to other events or verbs (Tomasello, 1992a; Olguin & Tomasello, 1993). Only later, on the basis of their general skills of categorization, do children begin to form more inclusive grammatical categories, including both syntagmatic categories such as "agent" and "instrument" and paradigmatic categories such as "noun" and "verb" (Braine, 1992; Maratsos, 1990; Tomasello & Olguin, 1993). The developmental transition to fully adult-like language—including all kinds of linkages among events and verbs into complex sentences—is based initially on children's knowledge of individual words, especially key verbs such as *want to, need to*, and *know*, and on their ability to encode the different discourse perspectives inherent in such things as questions and passives (Bloom, 1992).

None of this is to deny that language skills may become more modularized during development, as do many domains of cognition (Karmiloff-Smith, 1992). But this developmental fact does not negate the phylogenetic and ontogenetic roots of language in such things as the basic cognitive processes involved in the understanding of event structures (Nelson, 1985, 1986) and on children's growing understanding of the intentions of adults, including their linguistic intentions (Tomasello, in press; Tomasello, Kruger, & Ratner, 1993). It is also important to stress that there are many different ways in which children may have trouble acquiring language, ranging from

the complete inability to acquire language of a significant proportion of autistic children, to the comparatively minor problems of some children with specific language impairments, to the problems with the mechanics of language that plague children with speech disorders of various kinds. It would seem reasonable in this context to think of language as a mosaic of different skills—a new function made out of old parts, in Bates' (1979) terms—some of which may be specific to language (e.g., speech) but some of which may be the same skills as those children use in other domains of their cognitive and social cognitive development. As these skills are used repeatedly in concert for purposes of linguistic communication, they cohere into a more modularized functional domain.

In all, it would seem that language is a much poorer candidate for the status of innate module (or instinct) than are several other domains of cognition. Languages are cultural artifacts that differ radically among different cultures, and languages change in important ways as the communicative needs of their speakers evolve over time. In addition, many of the subcompetencies of language acquisition would seem to be shared with other domains of cognition: competence with words depends on general processes of symbol formation and categorization; competence with syntax depends on general processes of symbol formation, categorization, and hierarchical organization; and competence with pragmatics depends on general skills of social interaction and communication. And, of course, the whole point of language—its semantic dimension—is for individuals to convey to one another something of the experiences they have nonlinguistically. In my view, there are any number of other proposed cognitive modules, such as naive physics and naive psychology (e.g., Karmiloff-Smith, 1992), that are much better candidates for modules or "instincts," because they deal with competencies that are much more uniform in their expression across cultures, much less dependent on specific types of interactive experiences, and much more internally coherent and distinct from other domains of cognition.

The point of this brief exposition of the Cognitive/Functional approach to language and its phylogeny and ontogeny is only to show that there is an alternative. The details of that alternative are still being worked out by many people, some of whom would disagree with some of my brief characterizations here. But what is certain is that there are many reasonable researchers who do not agree with the Generative Grammar characterization of language, or with its goal of mathematical elegance, or with its selective use of evidence for the purpose of confirming its formally derived, theory-internal notion of linguistic nativism. On the whole, I find myself fully in agreement with Braine's (1994) trenchant analysis to the effect that the generative and Cognitive/Functional paradigms have fundamentally different goals. At heart, Chomskyan nativism is a philosophical endeavor

to discern by means of logic what is uniquely and innately human. Cognitive and Functional approaches are scientific endeavors aimed at understanding how people learn and use natural languages.

CONCLUSION

In the preface to his book, Pinker states that "My home institution, the Massachusetts Institute of Technology, is a special environment for the study of language." All I have tried to do here is to underscore that statement, so that developmentalists who do not study language for a living can see the claims of this popular book for what they are: the theoretical positions of one side of a debate presented as if they were the only side.

The other side of the debate is represented by the new approaches to language created by cognitive and functional linguists who believe that the intercourse between linguistics and psychology is bidirectional (Lakoff, 1987, 1990; Langacker, 1987a, 1992). In this view, linguists must base their theories on more than formal considerations; they must based them on constructs that are supported by research in the other behavioral and cognitive sciences. Consequently, psychologists and other cognitive scientists may contribute to, as well as benefit from, the construction of linguistic theories. For developmentalists, this means that we must take an active role in helping to theoretically characterize, as well as to empirically investigate, the structure of language as it is experienced by children at different stages of their ontogenies. These new approaches to language thus open up for us, for the first time in recent history, the possibility of investigating in a meaningful way the *psychology* of language and its development.

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