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Book Review

The Origin of Language

The Symbolic Species: The Co-evolution of Language and the Brain
by Terrence W. Deacon
Penguin, 1997

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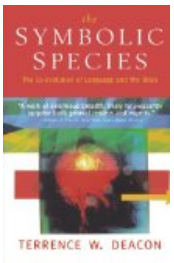

'In the beginning was the Word'. So the Bible seems to acknowledge the specialness of language, the distinctive characteristic that separates the human from all other species, even from the other great apes. It is not the ability to communicate that distinguishes us. Other species communicate and depend for their continued survival upon successful communication. It is communication of a particular kind: no other species makes promises or poems.

When did language arise, and how? And why? If it is of value for the survival of a species, as it clearly is, then why has only one species succeeded in acquiring full-blown language? The theory of evolution offers a framework in which these questions may be addressed. The difficulty is that language, spoken or signed, leaves no lasting trace. Which of our ancient ancestors had language, and what form their language had are matters that must be inferred from a record of fossils and ancient artifacts that is extremely sparse.

The idea of studying the generation and processing of language in brains by the standard experimental method of science meets a different difficulty: ethical constraints severely limit the types of experiment that may be performed. Much of what is known about the workings of the brain has had to be gleaned from evidence that is only serendipitously available: for well over a century, careful observation of what goes wrong in brains that are physically damaged (by accident or through beneficial medical procedures such as the removal of tumours) has contributed to the development of a picture in which, broadly speaking, certain areas of the brain are distinguished by their special functions.

The Symbolic Species includes a nice overview and analysis of the extraordinary ways in which different types of brain damage and genetic defect are manifest in linguistic and other behaviours. But, by bringing to bear observations made with new technologies, it calls into question accepted views of what is going on. Thanks to PET (positron emission tomography) scans and magnetic resonance imaging we are now able to look into brains at work. These methods give a limited indirect picture of brain activity, showing only levels of blood flow or glucose metabolism, rather than the firing of individual neurons which is presumed to be the core activity of the brain. Nevertheless a picture of language processing is emerging that is much more complex.

Rather than a division of the brain into regions with different tasks, the new picture is one in which connections between diverse regions assume much greater importance. The brain circuits that go to work when you mechanically recite a known list of words, such as the days of the week, are different

from those that are active when you utter a list of words that requires more thought, such as naming several kinds of cat, though there may be some overlap between the two. Moreover, in listening to sentences many connections are active in parallel, so that, for example, one circuit may be handling the construction of words from phonemes, while another is engaged in building meaning and another deals with emotional nuances. It appears that this break-down into modular tasks is determined

to a substantial extent by issues of timing, so that tasks which must be performed quickly are handled by communication between physically close regions of the brain, while those that can be done more slowly are more spread out. Little is known of how all this activity is synchronized to give our coherent serial output of speech and unitary awareness of conversation, but it may be expected that the well-developed mathematics of signal processing will have to be brought to bear on these problems.

Terrence Deacon works at the interface between neurobiology, developmental biology and biological anthropology. He is ideally placed to bring together the insights of the very different sciences of paleontology and physiology into the nature and origins of language. The pleasures of his book are in the detail, the expert knowledge that the author brings to bear, the lucidity of writing that must at times be quite technical. To omit the details of brain physiology, for example, and of the extraordinary process of individual brain development from birth to maturity would have been to short-change the reader. The detail is necessary and Deacon is skilled in making it accessible to the non-expert. One concession that might have been made to the limitations of the brains of ordinary readers would have been to provide a glossary; it is annoying to have to turn to a dictionary for the meanings of essential technical terms like ‘dorsal’ or ‘Pleistocene’.

The span of time over which language has been around is a subject of debate. One popular view, based on the sudden appearance in the archaeological record of evidence for a jump in sophistication of primitive technologies and of representational art, sees language with syntax (rather then just individual words) as very recent in the evolutionary scheme: perhaps it has been with us for as little as one or two hundred thousand years, a very short period in the evolution of our species. From his knowledge of brain structure, and of the rates of evolutionary change Deacon convincingly argues for a very different story. He sees language as evolving slowly in fits and starts over a period of two million years or more. He suggests that our ape-like ancestors prior to that, the *australopithecines*, had the kinds of communication capabilities that can be observed today in apes and monkeys. They made sounds or signs of aggression and appeasement, sounds or signs to warn and perhaps to comfort. Relics of those primitive calls persist in humans to this day, for example in the tongue clicking and other noises that we use when we communicate with babies.

The evolutionary move forward to language, made only by humans, was triggered, Deacon believes, by the change that humans made from a largely vegetarian diet to one that regularly included meat, a change marked in the fossil record by the first appearance of tools - stones with sharp edges intentionally shaped by chipping to allow the hacking of meat and hide. That change of behaviour was preceded and accompanied by slow evolutionary changes of physiology, including the transition to bipedal gait and to a hand structure that allowed efficient gripping, and by increases in brain size and complexity. *Homo habilis*, the new species that appears in the fossil record about two million years ago had a brain that was about fifty percent larger than the australopithecine’s, though still only half the size of a modern human brain.

Adding a hunting mode to a gathering mode of subsistence reduced dependence on seasonal vicissitudes, and supported greater mobility, but it also brought about new pressures to be dealt with by natural selection. The strong instinct, naturally selected, of males is to support and promote their own genes through their progeny. How is the hunter, away from the community for long periods, to be sure that the young that he provides for are his own? It is an ancient concern! The suggestion is that the need for binding contractual supports of mating exclusivity, guaranteed by the community—in a word, of marriage—may have been a main pressure to which an elaborated language was the response. Over hundreds of thousands of years, developing language provided this and other benefits. Deacon's construction of this story, to which no brief outline could do justice, is fascinating in its detail and careful argument.

The book's title picks up a conception of the very original American mathematician C. S. Peirce. He distinguished between different kinds of representation: the iconic, the indexical and the symbolic. In an iconic representation (such as a drawing) there is a clear connection between the representation and what it represents. In an indexical representation, the connection between the two is purely conventional. The lack of any connection between (the sound of) a word and what the word names is an essential feature of language; it brings with it the freedom to create new words at will, to name

whatever we want to name. But it is the step to the symbolic, Deacon suggests, that has only been made by humans. In symbolic representation, relationships between objects are represented as relationships between words. Deacon's analysis of these matters is the most conceptually difficult and least satisfactory part of the book. The problems stem, I think, from his refusal to consider seriously the formation and significance of the basic unit of symbolic language: the sentence.

What is most obviously missing from Deacon's account is what, on the face of it, should be most relevant: linguistics, the study of language as it actually is. In a section called 'Chomsky's Handstand', and elsewhere, he effectively dismisses what, until now, has been recognized as one of the great revolutions in thought of the twentieth century. One feels that the author may view this negative as the main contribution of his book. The gist is suggested by this sentence: "Children's minds need not innately involve language structures, if languages embody the predispositions of children's minds!" Language, in other words, has evolved to fit the capabilities of brains, more than brains have evolved to fit language. This is typical of the kinds of insight, or ways of talking, that are offered by the natural selection point of view, at the same time apparently profound, but somehow curiously trivial or even vacuous.

Chomsky's arguments are carefully constructed and sophisticated, but the essence is familiar to people interested in language. He noted that the acquisition by children of language skills far exceeds what could be achieved if they began, so to speak, with a blank sheet—if they had to learn their native languages inductively, merely from the evidence provided by speech that they hear. 'The poverty of the stimulus' is the catch phrase. Therefore, the argument goes, the infant brain must be pre-disposed to the acquiring of language. There is nothing here that conflicts with the idea that language has evolved to fit the capabilities of brains.

In his early writings, forty years ago, Chomsky spoke, perhaps unfortunately, of a 'language organ'. The term suggests the possibility of usefully isolating in the brain those mechanisms that contribute to the generation and understanding of speech. The evidence of brain research presented in *The Symbolic Species* suggests that the exercise may not be worthwhile. Language processing is mixed with too many other kinds of processing to be viewed as the independent activity of a specialized organ. The evidence is that language processes are substantially supported by pre-existing brain mechanisms, mechanisms that have been commandeered for speech by virtue of the survival benefits that speech brings. For example, as you formulate a phrase, one of your brain activities is the motor control of tongue and larynx needed to produce the sounds, and it appears that some shadow of these processes occurs even if you don't actually speak. Processes needed for motor control appear to be used for thinking. The brain has not been tidily designed to achieve goals that would be of value to the human species; rather, over hundreds of thousands of years genetic modifications of the brain have serendipitously occurred, and those that happened to be of survival value have persisted. That is the process of natural selection. The result is a mess, but a mess that works.

Natural languages differ from one another in many ways, but they have much in common too. *Universal grammar* is the name that has been given to what is shared. According to Terrence Deacon, "the idea that an innate universal grammar is the only way to account for language abilities was first argued by the MIT linguist Noam Chomsky." But this misconstrues the situation. Rather, it is universal grammar that must be accounted for by any theory of the evolution of language. Why is it that natural languages have so much in common, a shared core, not of words, but of structure? It is inadequate to say that the universal features "have emerged spontaneously and independently in each evolving language, in response to universal biases in the selection processes affecting language transmission". Account must be taken of the power of structured language to support not just communication but creative rational thought.

The studies of brain processes and brain evolution presented in *The Symbolic Species* point the way towards a multi-faceted solution. What brains do when they process sentences of a natural language is to some extent independent of the language. The commonalities are manifest externally in the utterances themselves—in universal grammar, about which a good deal is known—and internally in the activity of the neuronal circuits—about which some basic facts are currently being discovered. Natural selection has made brains that way, but thanks to the thinness of the pre-historical record, it seems that the story of how that happened will remain largely speculative. Before long, however, it may be that computer simulations will contribute to such speculations in the same kind of way that they have contributed to speculations about the origins of the universe. What will be needed is to bring together two strands of computing that are currently under vigorous development: *agent computation*, in which more or less autonomous computer entities communicate with one another, share information and learn, and *genetic computation*, in which the mechanism of natural selection is harnessed to improve

performance of programs.

The twentieth-first century will bring answers, one hopes, to deep questions about language that are essential to filling out the story, questions that are not asked in Deacon's book. Why is it that we say what we say when we say it? This is not a problem of grammar or semantics. It is not easy to see how to come to grips with it. Perhaps for that reason, this problem of the mechanisms that generate speech and thought has not attracted much attention from linguists either. It is a problem that must be addressed if we are to come to understand how it is that the human brain—a wonderfully intricate and powerful physical system, but a physical system nonetheless—can produce the most distinctively human characteristic: language, and what it supports, abstract thought. And prior to this is an even more basic problem: what is it about the stringing together of words in sentences that produces the power that natural selection has latched onto in the co-evolution of the human brain and human language. Why does language work?

* Desmond Fearnley-Sander is a mathematician with research interests in language and rationality.

Citation

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