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Book review

Terrence Deacon, The symbolic species: The co-evolution of language and the human brain. London: Penguin, 1997. 527 pp. £8.99.

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This is a brilliant book – original, well-informed, well-written and intellectually exciting.[1] No doubt readers of this journal will disagree with some of the claims about language, but they can be sure to agree with even more, and to learn a great deal on the way. This is partly because Deacon is a distinguished neuroscientist and evolutionary anthropologist, so he can speak with authority about things that we, linguists, only know about second hand. But even when he is talking about language itself, he forces us to see it in a much broader perspective than most of us are used to.

The leading idea is that what makes language special (and unique to humans) is the fact that it uses symbols, rather than the fact that it is complex. He starts with a question that an eight-year old asked him: 'If animals can't learn languages like ours because they're too complex, why don't they have simple languages?' This stumped him, and apparently led to the rethinking contained in this book. His answer in turn generates three questions: (1) What are symbols, and why are they so special?; (2) How do our brains handle symbols, and why can't animal brains do the same?; (3) How did our brains 'co-evolve' with language to produce the present situation?

The book is divided into three parts which deal with these questions in turn. The discussion goes into a great deal of detail (especially in Part 2, about brains, where I'm afraid Deacon told me more than I really wanted to know), which is why the book is so long. This review is not the place to evaluate his ideas on brain structure or on co-evolution, nor am I the person to do so; I can merely take his word for the factual claims (though I note that one expert reviewer questions his fundamental claim that the human prefrontal lobe is over-developed in comparison with other pri-

[1] I should like to thank Terrence Deacon for a stimulating discussion of an earlier version of this review. I also benefitted from discussion of the book with Scott Delancey, Mike Tomasello, Tim Wharton and Beth Simon.

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mates – Holloway, 1998), and admire his ability to tell an entertaining and coherent story. Instead, I shall focus on Part 1, where linguistics is most relevant.

In thinking about symbols, Deacon has found his way into Peirce's version of semiotics. As readers are no doubt aware, Peirce (1931) founded one of the two main traditions in semiotics (for a helpful review of the field see Urban, 1992) and is best known for his three-way division of signs: 'icons' are based on similarity between the sign and what it refers to, 'indices' are based on contiguity in space or time, and 'symbols' have no basis other than convention. Thus a map refers iconically to the territory that it covers, smoke refers indexically to the fire, and a red light refers symbolically to the need to stop – as does, of course, the word *Stop!*. This classification is what Deacon builds on in his theory of symbols – though he offers a somewhat different definition of symbols – and he shows convincingly that animals can interpret both icons and indices, but are (generally) defeated by symbols. Why? To answer this question he has to analyze the nature of symbols and what cognitive demands they make, which go beyond the demands of icons and indices. Not surprisingly, most of the discussion is about the best-known symbol system, language, and it is in this discussion that his argument is most difficult to follow. Nevertheless the basic ideas are very suggestive and deserve to be developed with help from us linguists.

He argues that the three classes of sign stand in a hierarchical relationship: icons are the foundation on which indices rest, and indices underlie symbols. Neat though this hierarchy looks, I am not convinced that indices rest on icons, because he seems to me to use 'icon' where other people simply talk of categorization (p. 74). Clearly, we can only recognize a recurrent indexical relationship if we can already classify events as 'same' or 'different' – e.g., if we can recognize distinct instances of the categories 'smoke' and 'fire'; but (contra Deacon) the relation between one bit of smoke and another one is not iconic, because neither of them is a sign which refers to the other (at least, not in any normal sense of 'sign' or 'refer'). We must surely be able to recognize classification or concept-formation as a mental activity in its own right, without squeezing it into the semiotic system. On the other hand, it does seem reasonable to see symbols as resting on indexical relations of co-occurrence. After all, the word *cat* very often does co-occur with a visible cat in a child's experience, so the link between the two may well be learned at first as an index, and to the extent that chimpanzees can learn 'words' it is explicable in terms of this kind of learning.

The crucial question, however, is what distinguishes symbols from mere indices. Deacon's answer is that it is the fact that a symbol is embedded in a system which connects it to other symbols. For him, the main defining characteristic of symbolic meaning is not that the relationship between sign and referent is arbitrary, but rather that the sign has ordinary indexical relationships to other signs – in short, the existence of a system of signs which cooccur in regular patterns, and which each has an indexical link to some referent.

The clearest explanation of this idea is in his discussion of an experiment with chimpanzees (pp. 84–92). The chimps concerned were Austin and Sherman, who were taught a very simple 'language' of lexigrams (arbitrary plastic chips) in two-sign 'sentences' consisting of a 'verb' followed by a 'noun'. There were only two

verbs and four nouns, but only four combinations were grammatical because one verb combined only with the two 'food' nouns (e.g., 'banana') while the other combined only with the two 'drink' ones. The chimps were taught these combinations systematically, and were also taught to distinguish them from the 'ungrammatical' patterns. The teaching took thousands of trials, but (according to Deacon) the result was true symbolic meanings for the lexigrams. Evidence for this claim includes the fact that Austin and Sherman generalized easily to new lexigrams, unlike another chimp (Lana) who had not received systematic training on symbol pairs. In Deacon's words, Austin and Sherman "had discovered that the relationship that a lexigram has to an object is a function of the relationship it has to other lexigrams, not just a function of the correlated appearance of both lexigram and object. This is the essence of a symbolic relationship" (p. 86).

Another way of putting the same idea is to say that there is an iconic relationship between the whole symbol system and the system of relationships among the objects symbolized (p. 88) – a set of relationships among relationships, or second-order relationships. This much seems quite clear and reasonable. What is less clear is precisely what kinds of relationships among symbols Deacon has in mind, but he seems to include both syntagmatic and paradigmatic relations (another important contrast which belongs to the other strand of semiotics that goes back to Ferdinand de Saussure, but which he does not mention). In some places, he is clearly thinking of paradigmatic relations, as when he discusses activation:

"The symbolic basis of word meaning is mediated ... by the elicitation of other words (at various levels of awareness). Even if we do not consciously experience the elicitation of other words, evidence that they are activated comes from priming and interference effects..." (p. 64, see also p. 82)

But elsewhere it is syntagmatic relations – i.e., syntactic co-occurrence patterns – that are in focus:

"Some sort of regimented combinatorial organization is a logical necessity for any system of symbolic reference. Without an explicit syntactic framework and an implicit interpretive mapping, it is possible neither to produce unambiguous symbolic information nor to acquire symbols in the first place. Because symbolic reference is inherently systemic, there can be no symbolization without systemic relationships. Thus syntactic structure is an integral feature of symbolic reference, not something added and separate. It is the higher-order combinatorial logic, grammar, that maintains and regulates symbolic reference." (p. 100, see also p. 136).

For a linguist this is a fundamental difference, so it is disturbing that they are never explicitly separated. No doubt if they were, they would turn out to make rather different contributions to the process of symbolization, but this kind of distinction is left for future work.

The most obvious advantage of symbols over mere indices is that they allow what linguists call 'displacement' – using a symbol to refer to some object which is not adjacent to the symbol either in space or in time. However, Deacon sees other benefits, which are at least as important as this. First, symbolization allows the 'co-evolution' of language and brain, because an increase in the complexity of language confers very great advantages on brains which can handle the complexity, so larger

brains are selected for, in spite of their cost (in terms of calorie consumption). This is an example of what is called 'Baldwinian evolution' (p. 322), in which the normal pressures of natural selection are amplified by the behavior selected for: the more people have the favored behavior, the more advantageous it is. (A standard example of Baldwinian evolution is the process by which societies which keep cows have evolved genetically so that adults can tolerate milk – an ability which in other populations disappears after infancy.)

Another advantage of symbolization is the possibility of representing both emotions and beliefs 'symbolically' in our minds – for instance we can think of anger without feeling angry, and we can consider the proposition that it is raining without actually believing that it is raining. Deacon does not explain exactly how this possibility emerges from the use of symbols, but it seems reasonable to link the two. It is easy to imagine a number of causal connections, all of which may be correct. One possibility is that symbolization encourages us to make permanent conceptual structures because symbols are themselves permanent; so instead of simply feeling anger on the odd occasion, we form a permanent concept of this anger which is distinct from the specific instances of anger. If this (or something like it) did, in fact, take place, then symbolization explains how we can hold concepts and propositions 'abstractly', even when we are not experiencing the corresponding perceptions and beliefs. This kind of thinking can be called 'symbolic', but it is important to remember that we are not claiming that the concepts are themselves symbols; rather they are symbolic because they are the stuff out of which the 'signified' term of a symbol can be built.

Symbolic thought, in turn, leads to the possibility of a 'theory of mind', since we can represent other people's emotional states symbolically without actually feeling their emotions (p. 427). To see the force of this argument it is enough to try to imagine a non-symbolic theory of mind in which my representation of your anger is the same as its representation in your mind. Clearly the result would then be pure empathy – I feel angry because you do; but this is wrong. It is more likely that I shall feel scared because I see that you feel angry. The same applies to propositional attitudes: I can see that you believe that it is raining (e.g., because you pick up your umbrella) without actually sharing that belief myself. Interestingly, Deacon claims that symbolization is handled in the same part of our brains as our ability to take another person's perspective – the prefrontal cortex (p. 427). Even more significantly, though, the ability to read other people's minds is itself an important element in learning symbols whose meanings are abstract – *anger*, *believe*, *nice*. This provides an important feedback loop because of the size and importance of the range of new concepts that become available for symbolization – a nice example of Baldwinian evolution.

Deacon's ideas are so fertile that it is hard to stop drawing consequences. For example, once our ancestors had some degree of symbolic ability, they were able to introduce the institution of marriage (p. 399), which depends entirely on the exchange of promises – an essentially symbolic activity. This, in turn, had the benefit of providing an environment in which children could take a relatively long time to mature, which, in turn, selected for those who could symbolize even more successfully (e.g., for dealing with domestic conflicts which threatened the marriage).

We could also speculate about the important symbolic function of languages as badges of group identity, a fact much stressed in modern sociolinguistics (Hudson, 1996: 12). As Deacon says, "[l]anguage is a social phenomenon. To consider it in purely formal, psychological or neurobiological terms is to strip away its reason for being" (p. 115). However hard such ideas may be to substantiate, they fit together very satisfyingly, thanks to Deacon's underlying insights.

These ideas are explicitly contrasted with those of the dominant school in linguistics centered on the work of Chomsky and Pinker. Deacon is impressively well informed about the psychological and evolutionary basis of these ideas (even if he, understandably, is less sure on the linguistic details), and presents well-constructed arguments against them. For example, he points out that abstract grammatical principles cannot be innate because genes can only determine "invariant neural computational processes" (p. 330) and processes apply to surface forms, not abstract underlying ones. However, it is important to stress that symbolization makes the human mind qualitatively different from that of other animals, so his ideas are equally opposed to the popular alternative to Chomsky in which the mind is a general-purpose connectionist machine (Elman et al., 1996).

Finally, what about syntax? As we have seen, Deacon asserts that syntax is essential for the development of our first symbols, but there is remarkably little discussion of syntax at all – remarkable given the importance of syntax in the arguments for Chomskyan innateness. It is easy to sympathize with a non-linguist who steers clear of syntax, but this is a gap that must be filled in order to provide a complete symbol-based account of language evolution and learning.

What Deacon does not mention, and perhaps did not know when he wrote this book, is that some linguists already espouse theories which are more or less compatible with his ideas. The crux lies in the relation between vocabulary and syntax. His theory explains vocabulary (as a set of symbols) but not syntax, whereas many of us believe that syntax is not different in kind from vocabulary – in short, that there is no boundary between 'the lexicon' and 'the rules of grammar'. This view is typical of the movement known as 'cognitive linguistics', which includes several specific theories – Cognitive Grammar (Langacker, 1987, 1990), Construction Grammar (Goldberg, 1995; Kay and Fillmore, 1999) and Word Grammar (Hudson, 1990, 1999). (A particularly useful survey of the main tenets with the needs of psycholinguists in mind is Tomasello, 1998.) One of the tenets that these theories share is that lexical items and syntactic constructions are patterns of the same kind, and differ only in terms of generality, so any mechanism which explains how lexical items are learned will generalize automatically to syntax.

Moreover, there are also linguists who believe that all of syntax is strictly lexical, in the sense that all the information about possible word-combinations is contained in the entries for individual words. Few would dispute this view in clearly 'lexical' matters, but it is much more controversial when applied to very general patterns of the kind that theoretical linguists tend to discuss. Among cognitive-linguistic theories, the view is most clearly represented in Word Grammar, where the whole of sentence structure consists of nothing but dependency relationships between pairs of individual words. For example, the structure of *she loves me* consists of a subject

relationship between *she* and *loves*, and an object relationship between *me* and *loves*. Once we know what dependency relationship each word allows, we can work out what sentences are allowed; for example, we know that *loves* requires a singular subject before it, and any kind of nominal object after it, so we know that this example sentence is well-formed. These facts need not be learned word by word – they can be stored at a more general level and applied by default inheritance (e.g., the need for a singular subject is inherited from the general category of verbs that end in *-s*) – but the important point is that they are facts about words, just like lexical facts.

The point of giving this information here is to support Deacon's theory against the charge that it ignores the main evidence for innateness, which lies in syntax. As mentioned earlier, he argues, on general principles, that grammar cannot possibly be innate (pp. 331–333), but he believes syntax is fundamentally different from vocabulary: "Chomsky argues that much of the child's knowledge of grammar and syntax is not learned in the way words are. I agree. It is discovered, though not by introspection of rules already available in the brain" (p. 107). However, he also thinks that the reason why syntactic patterns are learnable is that a small child's very limited attention and memory span act as a filter for the 'noise' of irrelevant long-distance syntactic links (p. 135). If theories like Word Grammar are right, this fact will help small children to learn syntactic facts about individual words, which means that syntax-learning is part of vocabulary-learning. This view of grammar-as-vocabulary has been confirmed by a number of empirical studies of language acquisition which have shown, on the one hand, that the development of grammatical constructions correlates very closely with the growth of the child's vocabulary (Bates and Goodman, 1997), and on the other hand that children tend to restrict grammatical patterns to specific lexical items, rather than to use them as general templates into which any lexical items can be fitted (Tomasello, 1992).

The symbolic species is highly compatible with the non-innatist, non-modular paradigm of language research called 'cognitive linguistics', and probably also sits comfortably with more functional approaches, as with a pragmatics which is not tied to any particular theory of grammar. But even for such people, it is a mind-changing book – speaking personally, I can't think of any other book that I have read in my forty years of scholarly life that has so deeply affected my view of language. On the other hand, it is a serious challenge for Chomskyan orthodoxy, and it would be a great pity if the lack of details about grammar (which is heavily criticized in one review – Poeppel, 1997) were to obscure this fact.

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