REVIEW, for *The Times Literary Supplement*, of
*The Symbolic Species: The co-evolution of language and the human brain*,
by Terrence Deacon (1997, Penguin Press).

Terry Deacon is a brain specialist. When he's not busy writing such monumental books as this (to add to his impressive portfolio of scientific articles), he is involved in such things as transplanting pig neurons into humans, or grafting a third eye onto a frog embryo. In this book, he displays an impressive grasp of a wide range of fields outside his own specialty. The book is at its strongest and most technical in the detailed discussion of the shape, function and evolution of brains, and in the related genetics and embryology. Deacon has surveyed the related fields of aphasia and other language-related disorders, but also ranged much further from his home base, delving into classics in the philosophy of language, such as Frege, Quine and C.S Peirce, linguistic theorizing in the Chomskyan tradition, social anthropology and paleontology. His authority, and the acceptance his ideas are likely to attract, can be graded in proportion to the distance he has ranged from his intellectual home base.

*The Symbolic Species* reads in many parts like a textbook, but Deacon has a more ambitious purpose, seen in his title and its subtitle, 'The co-evolution of language and the human brain'. What makes us humans special, and gives us our unique ability for complex language, he argues, is our capacity for what he calls 'symbolic reference'. This is our ability to form complex mental networks of relationships between 'symbols', which need not be directly grounded in experience. Deacon identifies the prefrontal cortex, significantly more developed in humans than in apes, as the area in which much language-related symbol manipulation takes place. This focus on meaning has an immediate appeal and plausibility lacking in Chomskyan approaches which emphasize the purely formal (grammatical) aspects of human language ability. 'Learnability theories' of language acquisition in the Chomskyan tradition seldom take into account the influence of semantic content on the grammatical patterns that the child acquires knowledge of. Deacon's term 'symbolic reference' is, in my view, unfortunately chosen and misleading (more on this below).

The book has been marketed by Penguin as if it were of the same ilk as, for example, Steven Pinker's recent *How the Mind Works*, a popularly accessible work, simultaneously entertaining and mildly provocative without being too taxing to read. *The Symbolic Species* is, however, much tougher going than popularizations by Pinker or Dawkins. Although he has catchy chapter and section titles (e.g. 'A loss for words', 'The Chihuahua fallacy', 'Why don't mammals sing like birds?'), and sometimes has a relatively down-to-earth or even occasionally an anecdotally chatty passage, the typical level is quite demanding, and requires concentration, especially in areas where the reader has no background knowledge to call on. Here is an example sentence: *The extent to which X-Otx2 becomes restricted to the head end of the neural tube can be experimentally manipulated by bathing the embryo in another differentiation factor (retinoic acid).* (p.180). For me, the required concentration paid off. I now think I understand some very technical stuff about Homeobox genes, the selective growth of brain connectivity, and the evolution of whole ontogenies much better than I did before. But it was hard work.

The book is structured into three parts, entitled 'Language', 'Brain' and 'Co-evolution'. The last is an argumentative synthesis of the preceding two. Deacon's thesis, as I understand him, is that the critical event in human evolution was the emergence of a mental ability to represent complex and internally coherent abstract systems of meaning, consisting of abstract entities, abstract properties of such entities and abstract relationships between them. To be sure, some of these abstractions are grounded in concrete experience, but the degree of systematic abstraction or 'symbolic reasoning' exhibited by modern humans is the key to understanding the complexity of our languages and cultures. It is this, and not a **grammatical** capacity, as Chomskyans hold, that enables children to acquire human languages so readily. This capacity for 'symbolic reference' is made possible by our enlarged prefrontal cortex. Over the past three million years, complex languages have evolved in communities, as cultural objects, outside of individual minds, although each individual acquires an internal representation of the language. The enriched cultural environment has exerted strong selective pressure for the spectacular brain evolution. Thus there was a strong feedback loop between brain size and symbolic culture, leading to the parallel expansion of both.

This argument may have much to recommend it, but it is not fully persuasive until the mechanisms and processes leading from 'symbolic reference' to the actual known complexities of human languages have been described in much greater detail. Deacon is no linguist. (He writes, for example of the 'passive tense'.) But, lamentably, very few linguists have taken an interest in the evolution of language. We are still waiting for evolutionary accounts of the structure of languages comparable in depth and intricacy to the vast store of data about languages accumulated over the past thirty years by linguists.

I have sketched what I think Deacon means by 'symbolic reference', and I think he may have a good point. But he has done himself no favours, in the sections dealing with this quite philosophical area, by using terminology in a radically unorthodox way, for philosophers of language, at least. Deacon plays fast and loose with the terms 'index', 'symbol' and 'reference'. As just one example, he writes of 'This referential relationship between the words — words systematically indicating other words ... ' (p.83). But this is just what reference, for a philosopher, is **not**. 'Reference' for a philosopher, or for a linguist, is a relation between an element in a language, like the word *John* and something in the world (its 'referent'), such the flesh-and-blood person John. One half of the relation is a bit of language; the other half of the relation is **not** a bit of language. (For some philosophers, but not all, this relation is mediated by a psychological entity, a person's mental image, or concept, of the thing referred to.) As is well known, and as Deacon knows, Frege classically contrasted 'reference' with 'sense'. When linguists try to pin down what the sense of a word is, they usually characterize it as the sum of the semantic relations between that word and other words. Nothing but confusion can come of using the term 'reference' for a relation between words and words. (It is clear that Deacon is not specifically talking about reference as a metalinguistic relation, holding between words of an object language and words of its metalanguage.)

No doubt, the terms 'symbol' and 'reference' may have a different sense in the discourse of neuroscientists and artificial intelligence experts, closer to Deacon's own background, but it is a pity that in a book of this sort, reaching out to a wide readership in other disciplines, such basic terms are used in a way that will cause confusion. As a measure of the difficulty (but also of the seriousness with which Deacon's book is being taken) I can report that I have participated in several reading groups, of university lecturers and postgraduate students in Linguistics and Cognitive Science, devoted to Deacon's chapter entitled 'Symbols aren't simple'. In all cases, the discussion groups have ended in disarray, with no one person able to convince the others of any particular interpretation of Deacon's complex three-layered diagram with six different kinds of arrows in it (p.87), illustrating his vision of the relationship between 'symbolic reference' and 'indexical reference'. Several people at these discussions agreed with me that Deacon's idea seemed to resemble Quine's view of a system of interdependent propositions, some of which are 'closer to the periphery of experience' than others. Ever hopeful, I put this interpretation of his work to Deacon himself in a conversation, but was told that that was not it, either. I'm not sure if the ideas of Quine's that I had in mind were what Deacon was familiar with — perhaps not. I have a hunch that Deacon's insight may be very valuable, but he has not explained it in terms that are unequivocally clear to linguists and philosophers. It would have been better to invent completely new terms for the completely mind-internal relationships that Deacon envisages, rather than to hijack old familiar terms for new purposes.

In the chapters on brain evolution, Deacon is on much firmer ground. He explains in patient detail why 'catastrophic' theories of brain evolution to account for humans' unique linguistic capacity are implausible. The more Deacon explains about the brain, the more naive such theories seem. The chapters in the middle part, 'Brain', take one systematically through the problems with evaluating the contribution of brain size, the genetic encoding of the developmental programs by which brains unfold in various species, the selective wiring processes in the brain that are not specifically genetically encoded, the parts of the brain responsible for signalling behaviour in birds, whales and humans, the special contribution of the prefrontal cortex in human mental activity, and the localization (or otherwise) of languages processes in specific brain areas.

Deacon's exposition is always civilized, scrupulously avoiding personal polemic and rhetoric. He never attacks other scholars' works directly, but deals with the central ideas that have been dominant in the history of the subject, and calmly sets out the relevant claims and known facts. In this, he sets a scientific example that I wish more would-be scientists who develop ideas on the evolution of language would follow. There is no doubt that this is an important book. It is very ambitiously conceived, and I believe it will be a point of reference (that term again!) in language evolution studies for years to come.

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