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The Symbolic Species: The Co-evolution of Language and the Brain by Terrence W. Deacon.
New York: W.W. Norton, 1997, 527 pp.

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In 1866, the recently formed Societe Linguistique de Paris passed an official resolution banning the presentation of any further papers regarding the origins of human language. The nature of the inquiry itself, it was felt, lacked even the possibility of scientific certainty, and all work pertaining to it was likewise dismissed on the grounds of being empirically irresolvable, incorrigibly speculative, and unproductively divisive.

Terrence W. Deacon, almost a century and a half later, has authored a provocative polemic that will doubtlessly incur even more violent censure on the part of his detractors. Empirically vigorous, incisively speculative and with the potential to be productively divisive, Deacon's *The Symbolic Species: The Co-Evolution of Language and the Brain* challenges many, if not most, of the assumptions underlying modern linguistic theory.

Of particular interest to linguists will be Deacon's refutation of Chomsky's (1972) Universal Grammar paradigm, as well as his corollary rejection of the possibility of innate syntactic processing or language-learning "modules" nestled deep within the human brain. Instead, claims Deacon, language itself—and the symbolic representation which it evinces and encodes—lies not inside individual brains at all, but at the interface between biology and culture.

A biological anthropologist with extensive experience in neurology, Deacon supports this argument first with an appeal to evolutionary theory. "Universality is not, in itself," Deacon proposes, "a reliable indicator of what evolution has built into human brains" (p. 339). Accordingly, the Chomskian notion that some kind of universal grammatical knowledge must be innate in human beings in order to account for certain otherwise unexplainable "universal features" regarding language is an argument which Deacon considers specious. Precisely because some version of Chomsky's model is so deeply embedded in contemporary linguistic theory, a considerable portion of The Symbolic Species is devoted to its refutation. It is this argument, to the exclusion of so many other fascinating and corollary arguments presented throughout the work, that this review will endeavor to reconstruct.

Fundamental to Deacon's argument is nineteenth century American psychologist James Mark Baldwin's (1895;1902) theory that the very context wherein natural selection takes place can itself be modified by the behavior of its inhabitants and that this modification may, in turn, generate subsequent new sets of selection

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pressures. By invoking the Baldwinian theory of evolution, Deacon specifically resists what he refers to as "the Lamarkian caricature" of a one-to-one mapping of adaptative response "from outside to inside the genome" (p. 326). Instead Deacon claims that the evolution that resulted in human beings' capacity for symbolic representation (and its "outward expression" which is language use) is incorrectly conceptualized as a teleological progress in design. Nature is not technology, Deacon reminds us. Evolution does not "design" so much as it "diversifies and distributes" in all directions (p. 29).

Human beings' eventual adaptation for our present linguistic capacity filled an environmental niche as specifically as did "the development of Arctic fish with anti-freeze in their blood" (p. 30). What is salient to Deacon's discussion is the realization that the absence of this particular adaptation is likewise meaningless outside the niche. Nature may react to us, but nature has no "plans" for us. Language is something that we developed for ourselves, Deacon argues, as part of the co-evolution of humans and their niche. What Deacon now must explain is why the Chomskian notions of brain module adaptation and Universal Grammar are at odds with current evolutionary theory.

Citing Conrad Waddington's (1957) work in genetic assimilation, Deacon demonstrates how there are seldom obvious links between behaviors induced by environmental changes and their long-term evolutionary consequences. The introduction of animal husbandry and agriculture into Africa modified selection pressures within the niche through its subsequent introduction into the population of mosquitoes carrying epidemic malaria. Genetic assimilation against this epidemic resulted in not just one, but in an entire series of blood protein molecular adaptations in humans, the most famous being cell "sickling" (from which derives sickle cell anemia). What evolution did not result in, as Deacon characteristically points out, was an inheritance for "mosquito-resistant skin or an abhorrence to standing water" (p. 326). Similarly, the kind of genetically inherited, "universally grammatical principles" envisioned by Chomsky and by Pinker (1994), Deacon argues, exceed the constraints on brain evolution regarding what kind of knowledge can and cannot become internalized.

Evolutionary theory holds that the levels of gene replacement necessary for any trait to become regularized are determined by "the intensity of selection, the stability of the conditions being adapted to, and the invariant features of the adaptative response" (p. 328). Yet, Deacon argues, the drastic amount of language change over periods amounting to little more than evolutionary 'instants' leaves "little possibility for mental adaptations to specific syntactic structures" (p. 329). Addressing the question of even more underlying processes, Deacon goes on to demonstrate how, while certain unchanging sensorimotor attributes of language use as well as invariants in the language learning context may have become internalized in human beings via Baldwinian evolution, the kind of Universal Grammar proposed by Chomsky and Pinker simply could not have been (p. 338).

Deacon begins his argument by noting that even the "deep structure invari-

ances" of Universal Grammar only weakly constrain the highly variable surface structures that implement it. Moreover, he observes, "it is just those grammatical structures which have been proposed most "universal" which are by their nature the most variable in surface representation, variably mapped to processing tasks, and poorly localizable within the brain between individuals or even within individuals" (p. 333). If this is as "invariant" as Universal Grammar can get, argues Deacon, it is a poor candidate indeed for genetic assimilation. For not only does the absence of correlates in the distinction between nouns and verbs, for instance, and some singular, observable (presumably neural) way in which that distinction is "processed in the same way in all brains under all conditions" tend to disprove the presence of a universal and innate grammar, but "the discontinuity between stimulus associations and symbolic reference associations, which is the basis of their [symbolic associations'] function . . . makes them *impossible to assimilate genetically*" (italics in original; p. 331, p. 332).

Here is where Deacon formulates his strongest, if not his most provocative, argument: "...no innate rules, no innate general principles, no innate categories" depending on such symbolic (as opposed to indexical) information, "can be built in by evolution" (p. 339). Thus, asserts Deacon, the entire theory of innate deep structure "paints itself into an evolutionary corner . . . by recognizing the logical independence of universal features from surface features" (p. 334). Deacon claims that our use of language is the outward expression and encoding of symbolic representation. Along with Peirce (1955), Deacon maintains that symbols, by definition, are directly mapped to other symbols, and not directly mapped to other objects in the world. Human beings do sometimes use words which communicate their referent indexically, "pointing to" that referent specifically amongst all the objects in the world. The vast majority of our linguistic "competence" is not of this variety, however. Rule-formulation and rule-following, reminiscences, narratives, explanations, predictions and every sort of spatially or temporally removed referencing and categorization must rely on symbol use in order to have any communicative efficacy. However, being physically unmappable to any solid thing in our environment, "symbols" are incapable of providing the invariantly existing stimuli for which evolution could ever generate genetic selection pressure.

Deacon has a theory of his own to posit as an alternative to the nativist viewpoint, and in the accompanying chapters on neurology, he systematically attempts to disprove the existence of an internally located "language processing module," which nativists assert is hard-wired somewhere deep inside the human brain. Instead, Deacon finds that evolution has endowed us with "a constellation of many indirectly related contributory influences and biases, and not an innate replica of the prior facultative behavioral response" (p. 326).

This constellation of bias and influences (as fully as in the case of the Arctic fish) constitutes an orientation—or learning emphasis—for a mode of being-in-the-world which is, Deacon continually reminds us, predominantly a virtual world of our own evolutionary creation. The expanse in our pre-frontal cortex which

arose as a response to the exigencies of symbol use, Deacon argues, has resulted in a "front-heavy" cognition which induces us to "recode our experiences, to see everything as a representation, to always expect there to be a deeper hidden logic" (p. 436). Symbol use alone allows us to ruminate, question, wonder and infer about the existence we find ourselves in, and symbol use alone allows us to construct the relationships, systems, societies and worlds that serve as answers to those questions and inferences.

A "virtual" world of stories and of counterfactuality thus supervenes upon our animal existence. Freed from the exigencies of an eternal present, we plan, hope, dream, dread, envision, and ultimately define ourselves in our relations with the rest of the naturally existing world. In realizing these visions, we create communities and collectively devise strategies to explore ocean bottoms and the far reaches of outer space. Our niche changes and expands accordingly. As products of that niche, in changing it, we change our consciousness and, thus, ourselves.

Surely, Deacon argues, language and the brain have co-evolved. And while the widely distributed neural emphasis which we have developed, at least for the present, manifests itself in the direction of symbolic representation, there is no innately underlying "key" or necessary regulative schematic such as "universal grammar" which passes along from generation to generation, defining for all time what can or cannot be intelligible to us in terms of human language.

This refutation of a bulwark of modern theory is just one of the many intriguing arguments to be found in The Symbolic Species. Equal parts neurology, philosophy, linguistics, and paleontology, Deacon's arguments often require quite a bit of willingness on the part of the reader to follow them on their highly circuitous but always rewarding and provocative routes. Yet it is a testament to the coherence of the work in general that this book, published just over a year ago, has already generated such intense interest and such profound argument in our field.

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