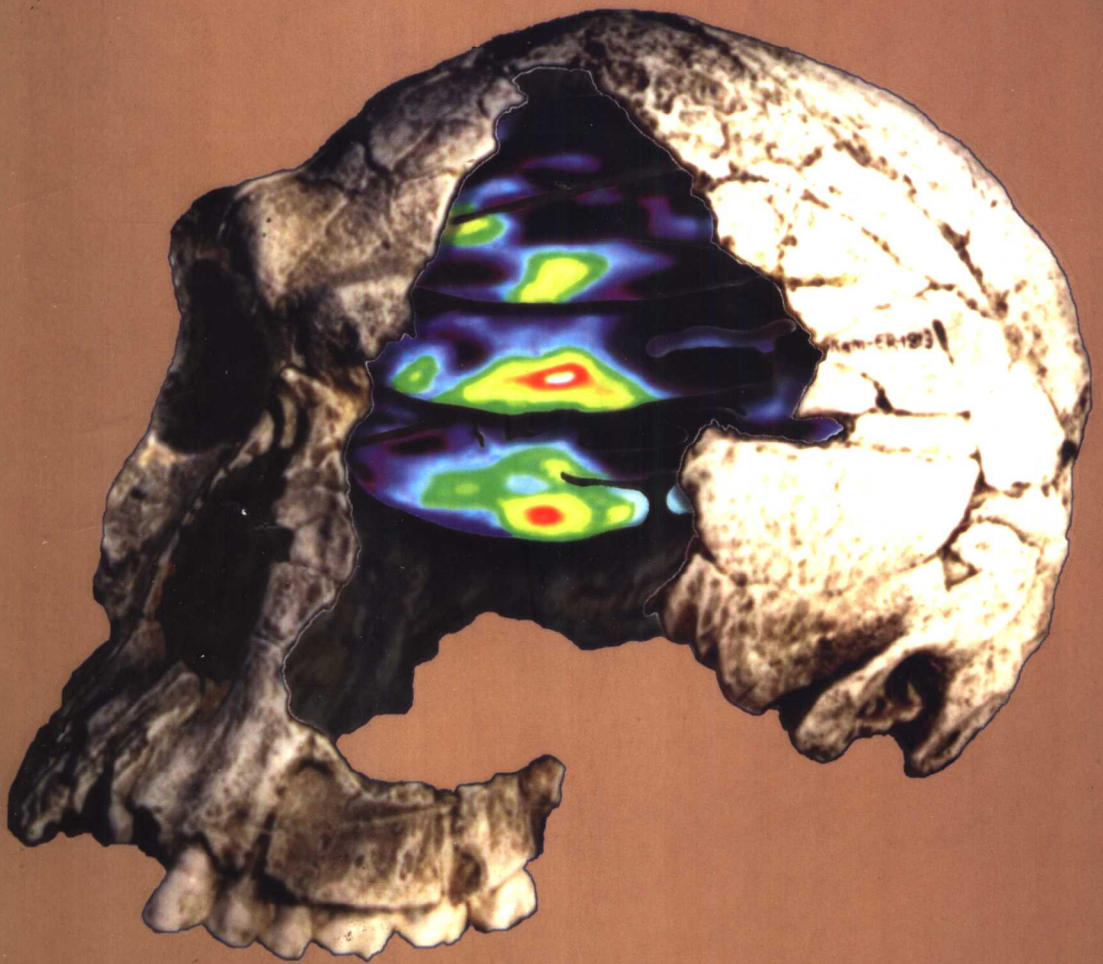


The SYMBOLIC SPECIES

The co-evolution of language and the brain



TERRENCE W. DEACON

The Symbolic Species

THE CO-EVOLUTION OF
LANGUAGE AND THE BRAIN

Terrence W. Deacon

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*The
Symbolic
Species*

*In memory of Harriet Deacon, my grandmother and first mentor,
who taught me to recognize the miraculous in everyday things.*

Very special thanks are due to my family, Cris, Anneka, and John, who supported me even as I stole precious time away from them to complete this work, and to my parents, whose encouragement I could always count on. Thanks are also due to many who have directly inspired, assisted, and endured this project. These include: Joseph Marcus, who read, edited, and commented extensively on earlier drafts and who has consistently held me to the high standards he expects from a mentor; my own mentors, who have knowingly or unknowingly contributed their insights and valuable criticisms, but who are far too numerous to list; my former student Alan Sokoloff, whose Ph.D. research on oral tract innervation underlies my thoughts on vocal evolution; David Rudner, Sandra Kleinman, Alan Aronie, and many other friends whose feedback has helped clear away some of the fog; my colleagues in the lab, who understood and picked up more of the load as my attentions were diverted from the lab bench; Robyn Swierk and Julie Criniere, who helped enter the endless corrections, and copyeditor Ann Adelman; Hoover the seal, who opened my ears to the mystery of speech; and my editor, Hilary Hinzmann, who was patient through my long spells of writer's block and overcommitment, and who helped nurse a rough collection of ideas and notes into a narrative. I can never adequately repay these many gifts.

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Preface

The conviction persists, though history shows it to be a hallucination, that all the questions that the human mind has asked are questions that can be answered in terms of the alternatives that the questions themselves present. But in fact, intellectual progress usually occurs through sheer abandonment of questions together with both of the alternatives they assume, an abandonment that results from their decreasing vitalism and a change of urgent interest. We do not solve them, we get over them.

—John Dewey

A number of years ago I was giving a brief talk about the evolution of the brain when someone asked a question I couldn't answer. It was not a complicated question. It didn't come from a colleague who had found a weakness in my theory or a graduate student who had read about a new experiment that contradicted my data. It came from a child in my son's elementary school class. I had given school talks on being a scientist before, and I thought I knew what to expect. I never expected an eight-year old to stump me.

I was talking about brains and how they work, and how human brains are different, and how this difference is reflected in our unique and com-

plex mode of communication: language. But when I explained that only humans communicate with language, I struck a dissonant chord.

"But don't other animals have their own languages?" one child asked.

This gave me the opportunity to outline some of the ways that language is special: how speech is far more rapid and precise than any other communication behavior; how the underlying rules for constructing sentences are so complicated and curious that it's hard to explain how they could ever be learned, and how no other form of animal communication has the logical structure and open-ended possibilities that all languages have. But this wasn't enough to satisfy a mind raised on Walt Disney animal stories.

"Do animals just have SIMPLE languages?" my questioner continued.

"No, apparently not," I explained. "Although other animals communicate with one another, at least within the same species, this communication resembles language only in a very superficial way—for example, using sounds—but none that I know of has the equivalents of such things as words, much less nouns, verbs, and sentences. Not even simple ones."

"Why not?" asked another child.

At this I hesitated. And the more I thought about it, the more I recognized that I didn't really have an answer. As far as I could tell no other scientists had seriously considered the question in this form. Why are there no simple languages, with simple forms of nouns, verbs, and sentences? It is indeed a counterintuitive fact. Myths, fables, fairy tales, animated cartoons, and Disney movies portray what common sense suggests ought to be the case: that other animals with their simpler minds communicate and reason using simpler languages than ours. Why isn't it so?

I'm not sure why I hadn't noticed this paradox before, or why other scientists hadn't. Most mammals aren't stupid. Many are capable of quite remarkable learning. Yet they don't communicate with simple languages, nor do they show much of a capacity to learn them—if our pets are any indication. Perhaps we have been too preoccupied with trying to explain our big brains, or too complacent with the metaphoric use of the term *animal language*, to notice this contradictory little fact. But the question may also have been unconsciously avoided because of the intellectual costs of considering it seriously. Indeed, the more deeply I have pursued this question, the more it seems like a Pandora's box that unleashes troubling doubts about many other questions that once seemed all but settled. This isn't the question we had been asking, but maybe it should have been. As Dewey suggests, the alternatives we pose in our scientific questions may not even address the most crucial issues.

This book starts with this curious question, because it supersedes many

of the questions we thought were more important, and because it stubbornly refuses to resolve itself as a side effect of the superiority of human intelligence or the savantlike language ability of young children. But in my efforts to answer it, I am forced to reopen many questions long thought to have been resolved, or at least reduced to a few alternatives which now appear less informative than we once thought.

In the chapters that follow, I investigate how language differs from other forms of communication, why other species encounter virtually intractable difficulties when it comes to learning even simple language, how human brain structure has evolved to overcome these difficulties, and what forces and conditions initiated and steered us along this unprecedented evolutionary course. What results is a detailed reappraisal of human brain and language evolution that emphasizes the unbroken continuity between human and nonhuman brains, and yet, at the same time, describes a singular discontinuity between human and nonhuman minds, or to be more precise, between brains that use this form of communication and brains that do not. My somewhat unprecedented approach to these questions unfolds as a step by step argument, in which each chapter builds on the questions, analyses, and evidence provided in prior chapters. At almost every step of the argument, I arrive at different interpretations from what might loosely be called the accepted theories in the field. So I suggest approaching this narrative as one might approach a mystery novel, where the order and presentation of clues are critical to the plot, because encountering the clues and unexpected conclusions out of context might require some tricky mental gymnastics to discover how they fit back together.

The presentation is broken up into three major sections. The first part of the book—Language—focuses on the nature of language and the reasons that it is virtually confined to the human species. The second part of the book—Brain—tackles the problem of identifying what is unusual about human brain structure that corresponds with the unique problems posed by language. The third part of the book—Co-Evolution—examines the peculiar extension of natural selection logic that is behind human brain and language evolution, and tries to identify what sort of communication “problem” precipitated the evolution of our unprecedented mode of communication. The book ends with some speculations on the significance of these new findings for the understanding of human consciousness.

A major intent of the book is to engage the reader in a reexamination of many tacit assumptions that lie behind current views. In service of these aims I have tried to make my presentation accessible to the broadest possible scientific audience and, I hope, to a scientifically interested lay audi-

ence. Whenever possible I have tried to explain technical points in non-technical terms, and although I have not avoided introducing biological and neuroanatomical terminology when it is relevant, I have tried to illustrate some of the more technical points in graphic form. Some readers may find the middle section of the book—Brain—a bit rough going, but I believe that a struggle with this material will be rewarded by seeing how it leads to the novel reassessment of human origins and human consciousness that I offer in the more accessible and imaginative last section of the book.

Almost everyone who has written on the origins of language recounts with a sense of irony how the Société Linguistique de Paris passed a resolution in 1866 banning all papers on the origins of language. This resolution was meant to halt a growing flow of purely speculative papers, which the Société deemed to be contributing little of substance and occupying otherwise valuable time and resources. A young discipline eager to model itself after other natural sciences could ill afford to sponsor research in a topic that was almost entirely without empirical support. But the shadow of suspicion that looms over language origins theories is not just due to this historical reputation. Language origins scenarios no more empirically grounded than their banned predecessors still abound in the popular science literature, and they provide a perennial topic for cocktail party discussions. What's worse, assumptions about the nature of language and the differences between nonhuman and human minds are implicit in almost every philosophical and scientific theory concerned with cognition, knowledge, or human social behavior. It is truly a multidisciplinary problem that defies analysis from any one perspective alone, and where the breadth of technical topics that must be mastered exceeds even the most erudite scholars' capabilities. So it is hard to overestimate the immensity of the task or the risks of superficial analysis, and it is unlikely that any one account can hope to achieve anything close to a comprehensive treatment of the problem.

I take this as a serious caution to my own ambitions, and must admit from the outset that the depth of coverage and degree of expertise invested in the topics considered in this book clearly reflect my own intellectual biases, drawing primarily on my training in the neurosciences and in evolutionary anthropology and supplemented by a dilettante's training in other important areas. Consequently, the book focuses on the various implications of only this one human/nonhuman difference in mental abilities—particularly neurological implications—and ignores many other aspects of the brain-language relationship. I have not attempted in any systematic way to review or compare the many alternative explanations proposed for the phe-

nomena I consider, and I have only discussed specific alternative theories as they serve as counterpoints to make my own approach clearer. An exhaustive review of competing explanations would require another book at least as long as this one. I apologize to my many scientific colleagues, who also have labored over these issues, for making this a rather personal exploration that does not do full justice to other theories, and does not explain why I do not even mention many of them. My own contributions are only possible because of the labors of untold dozens of previous researchers whose work has informed and influenced my own, and to whose contributions I have added only a handful of new findings. For those interested, I have tried to provide a reference to other approaches to these same puzzles in the end notes.

In what follows, it may appear as though I am a scientist with a naturally rebellious nature. I must admit that I have an attraction to heresies, and that my sympathies naturally tend to be with the cranks and doubters and against well-established doctrines. But this is not because I enjoy controversy. Rather, it is because, like Dewey, I believe that the search for knowledge is as often impeded by faulty assumptions and by a limited creative vision for alternatives as by a lack of necessary tools or critical evidence. So I will have achieved my intent if, in the process of recounting my thoughts on this mystery, I leave a few unquestioned assumptions more questionable, make some counter-intuitive alternatives more plausible, and provide a new vantage point from which to reflect upon human uniqueness.

