Appendix I Reading 2: The Human Paradox

Excerpt from Chapter I of Terrence W. Deacon's book The Symbolic Species

As our species designation – *sapiens* – suggests, the defining attribute of human beings is an unparalleled cognitive ability. We think differently from all other creatures on earth, and we can share those thoughts with one another in ways that no other species even approaches. In comparison, the rest of our biology is almost incidental. Hundreds of millions of years of evolution have produced hundreds of thousands of species with brains, and tens of thousands with complex behavioral, perceptual, and learning abilities. Only one of these has ever wondered about its place in the world, because only one evolved the ability to do so.

Though we share the same earth with millions of kinds of living creatures, we also live in a world that no other species has access to. We inhabit a world full of abstractions, impossibilities, and paradoxes. We alone brood about what didn't happen, and spend a large part of each day musing about the way things could have been if events had transpired differently. And we alone ponder what it will be like not to be. In what other species could individuals ever be troubled by the fact that they do not recall the way things were before they were born and will not know what will occur after they die? We tell stories about our real experiences and invent stories about imagined ones, and we even make use of these stories to organize our lives. In a real sense, we live our lives in this shared virtual world. And slowly, over the millennia, we have come to realize that no other species on earth seems able to follow us into this miraculous place.

We are all familiar with this facet of our lives, but how, you might ask, could I feel so confident that it is not part of the mental experience of other species-so sure that they do not share these kinds of thoughts and concerns when they cannot be queried about them? That's just it! My answer, which will be argued in detail in the following chapters, has everything to do with language and the absence of it in other species. The doorway into this virtual world was opened to us alone by the evolution of language, because language is not merely a mode of communication, it is also the outward expression of an unusual mode of thought – symbolic representation.

Without symbolization the entire virtual world that I have described is out of reach: inconceivable. My extravagant claim to know what other species cannot know rests on evidence that symbolic thought does not come innately built in, but develops by internalizing

the symbolic process that underlies language. So species that have not acquired the ability to communicate symbolically cannot have acquired the ability to think this way either.

The way that language represents objects, events, and relationships provides a uniquely powerful economy of reference. It offers a means for generating an essentially infinite variety of novel representations, and an unprecedented inferential engine for predicting events, organizing memories, and planning behaviors. It entirely shapes our thinking and the ways we know the physical world. It is so pervasive and inseparable from human intelligence in general that it is difficult to distinguish what aspects of the human intellect have not been molded and streamlined by it. To explain this difference and describe the evolutionary circumstances that brought it about are the ultimate challenges in the study of human origins.

The question that ultimately motivates a perennial fascination with human origins is not who were our ancestors, or how they came to walk upright, or even how they discovered the use of stone tools. It is not really a question that has a paleontological answer. It is a question that might otherwise be asked of psychologists or neurologists or even philosophers.

Where do human minds come from? The missing link that we hope to fill in by investigating human origins is not so much a gap in our family tree, but a gap that separates us from other species in general. Knowing how something originated often is the best clue to how it works. And we know that human consciousness had a beginning. Those features of our mental abilities that distinguish us from all other species arose within the handful of million years since we shared a common ancestor with the remaining African apes, and probably can mostly be traced to events that took place only within the last 2 million. It was a Rubicon that was crossed at a definite time and in a specific evolutionary context. If we could identify what was different on either side of this divide – differences in ecology, behavior, anatomy, especially neuroanatomy – perhaps we would find the critical change that catapulted us into this unprecedented world full of abstractions, stories, and impossibilities, that we call human. It is not just the origins of our biological species that we seek to explain, but the origin of our novel form of mind. Biologically, we are just another ape. Mentally, we are a new phylum of organisms. In these two seemingly incommensurate facts lies a conundrum that must be resolved before we have an adequate explanation of what it means to be human.

Advances in the study of human evolution, the brain, and language processes have led many scientists confidently to claim to be closing in on the final clues to this mystery. How close are we? Many lines of evidence seem to be converging on an answer. With respect to our

ancestry, the remaining gaps in the fossil evidence of our prehistory are being rapidly filled in. Within the last few decades a remarkably rich picture of the sizes and shapes of fossil hominid bodies and brains has emerged. It is probably fair to say that at least with respect to the critical changes that distinguish us in this way from other apes, there are few missing links yet to be found, just particulars to be filled in. That crucial phase in hominid evolution when our ancestors' brains began to diverge in relative size from other apes' brains is well bracketed by fossils that span the range. As for the inside story, the neurosciences are providing powerful new tools with which it has become possible to obtain detailed' images from working human brains performing language tasks, or to investigate the processes that build our brains during development and distinguish the brains of different species, or even to model neural processes outside of brains. Finally, linguists' analyses of the logical structure of languages, their diversity and 'recent ancestry, and the patterns that characterize their development in children have provided a wealth of information about just what needs to be explained, and comparative studies of animals' communications in the wild and their language-like capacities in the laboratory have helped to frame these questions with explicit examples.

Despite all these advances, some critical pieces of the puzzle still elude us. Even though neural science has pried ever deeper into the mysteries of brain function, we still lack a theory of global brain functions. We understand many of the cellular and molecular details, we have mapped a number of cognitive tasks to associated brain regions, and we even have constructed computer simulations of networks that operate in ways that are vaguely like parts of brains; but we still lack insight into the general logic that ties such details together. On the whole, most neuroscientists take the prudent perspective that only by continuing to unmask the details of simple neural processes in simple brains, and slowly, incrementally, putting these pieces together, will we ever be able to address such global theoretical questions as the neural basis for language. We must add to this many new problems arising out of the comparisons of animal communication to language. If anything, these problems have become more complex and more confusing the more we have learned about the sophistication of other species' abilities and the paradoxes implicit in our own abilities. But the most critical missing piece of the puzzle is access to the brains in question: ancestral hominid brains. Though we have considerable information about brain sizes in fossil species, and a little information about brain shapes, the relevant anatomical information, the internal micro architecture of these brains, has left no fossil trail. With respect to fossil brains, we will

never find the "smoking gun" – the first brain capable of language. We will only have access to circumstantial information.

So, what business do we have speculating about the beginnings of language?

Given the complexity of the human brain, our current ignorance of many of its crucial operating principles, and the fact that neither languages nor the brains that produce them fossilize, there would appear to be many more immediate questions to be answered before even considering this one.

There seem to be too many loose ends and gaps in the supportive evidence to provide solid leads in the search for clues to the nature of the human mind in the origins of language.

But this ignores the significance of the fact that language is a one-of-a-kind anomaly. Often the most salient and useful hints about the underlying logic of nature's designs are provided when unique or extreme features in two different domains are found to be correlated. Some notable examples include the correlation between superconductivity and extreme cold; between greater cosmic distances and the increasing redness of starlight; between the massive extinctions of fossil species and evidence of extraterrestrial impacts; between the peculiarity of haplo-diploid genetics and war, suicidal defense, and infertile castes in social insects; and so on. Each of these correlations cried out for an explanation and in so doing offered a critical clue to a more general principle. The more two related features diverge from what is typical in their respective domains, the more penetrating the insight that can be gleaned from their underlying relationship.

In this context, then, consider the case of human language. It is one of the most distinctive behavioral adaptations on the planet. Languages evolved in only one species, in only one way, without precedent, except in the most general sense. And the differences between languages and all other natural modes of communicating are vast. Such a major shift in behavioral adaptation could hardly fail to have left its impression on human anatomy.

Even superficial appearances bear this out. We humans have an anomalously large brain and a uniquely modified vocal tract. Though these clues offer no more than a starting point, they suggest that the structural and functional relationships underlying these superficial correlations are likely to be robust and idiosyncratic to us.

Ironically, then, the problem of language origins may actually offer one of the most promising entry points in the search for the logic linking cognitive functions to brain organization. To the extent that the unique mental demands of language are reflected in unique neuroanatomical

differences, we may find an unequivocal example of how nature maps cognitive differences to brain structure differences. Though the details of this mystery are challenging, no critical pieces of this puzzle lie buried in the deep evolutionary past or inaccessible to current technology. They are observable in the differences in cognitive abilities and brain structures to be found in living species.

I think that the difficulty of the language origins question is not to be blamed on what we don't know, but rather on what we think we already know. We think we know that what keeps language from being a widespread phenomenon is its byzantine complexity and the incredible demands it places on learning and memory. We think we know that language became possible for our ancestors when these impediments to language learning were overcome by some prior change in the brain. Depending on which aspects of language are deemed to be most complex, different prior adaptations are invoked to explain how language became possible. Perhaps it required an increase in intelligence, a streamlining of oral and auditory abilities, a separation of functions to the two sides of the brain, or the evolution of a sort of built-in grammar. I think we can be sure of none of these things. In fact, I think that the problem is more basic and far more counterintuitive than is assumed by any of these accounts.

There are a few common assumptions shared by all of these explanations that I think are the root of a deeper problem. In general, these arguments parallel many others that continually resurface along that age old divide between nature and nurture. Is language imposed from the outside or does it reflect what is already inside? For decades, the superficiality of this stale dichotomy has been evident, exposed by research in the psychological and biological sciences that demonstrates how truly complex and interdependent the biological and environmental contributions to development can be; but we still find it difficult to conceive of these phenomena in other terms.

We have reinvented the same old answers in new guises in each generation, stubbornly insisting that the answer to the question of language knowledge must be found in one of just a few major alternative paradigms (depicted in cartoon fashion in Figure 1.1).

At one end of this spectrum is the assumption that the architecture of language originates entirely outside (simple associationism); at the other end is the assumption that it originates entirely inside (mentalese). What other alternatives could there be, that are not captured between these extremes?

And if there are no other alternatives, then shouldn't answering this question also point to the solution to the language origins question? Discovering which aspects of language knowledge are contributed by nature and which by nurture ought to tell us what difference in us was necessary to bridge the original language acquisition gap. If the answer lies more toward the associationist end of the spectrum, then evolution must have given us language by endowing us with exceptionally powerful learning and memory.

If the answer lies more toward the mentalese end, then evolution must have endowed us with remarkably sophisticated instinctual knowledge of language that made learning completely unnecessary.

In light of these intuitively compelling alternatives, the approach I am about to take may seem misguided. Not only do I think that these alternatives confuse the nature/nurture problem more than they illuminate it, I think that the whole question of where language knowledge originates during development is secondary. Though a young child's almost miraculous development of language abilities is indeed a remarkable mystery – one that will be considered in some detail later (in Chapters 4 and 11)-1 think that the cause of language origins must be sought elsewhere, and by pursuing some very different kinds of research questions. While we have been worrying about where knowledge of language comes from, we have been avoiding a more basic question: What sort of thing is knowledge of language anyway?

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