Kim Sterelny
The Evolved Apprentice: How Evolution Made Humans Unique.
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Sterelny begins this book by informing the reader that it is an essay in the philosophy of nature, but this is far too modest an assessment. What *The Evolved Apprentice* offers is nothing short of a theory of human evolution. Though he may be employing a number of tools taken from the philosopher's toolbox, Sterelny is very much working from within science.

Sterelny's intent is to provide an alternative to what he calls 'the standard picture' of human evolution, which is more or less the established view within evolutionary psychology and without. According to this account, human evolution was primarily driven by social rather than environmental selection pressures – the fittest hominins were those that were most successful at obtaining the benefits of cooperation and avoiding its costs. Suppose A has more meat than he could possibly eat, and B is near starvation. And suppose that A and B anticipate a reversal of fortune in the coming months. A can then expect a healthy profit by trading some of his present surplus – which has relatively little value to him – for some of B's future surplus – which will have a great deal of value to A when he later finds himself at the brink of starvation. But, of course, this profit can be realized only if B keeps to his word. Thus, selection would have favored minds capable of correctly assessing the motives of would-be cooperators and would-be cheaters. On the other hand, what's ideal from B's point of view is to promise now and renege later. Thus, selection would also have favored minds adept at deception. These conflicting evolutionary forces are supposed to have resulted in a kind of evolutionary arms race: as would-be cooperators got better at assessing motives, would-be defectors got better at dissembling, and as would-be defectors got better at dissembling, would-be cooperators got better at assessing motives. It's social chess that fueled the evolution of our oversized brains.

Associated with this adaptive hypothesis concerning the engine of human evolution is a psychological hypothesis concerning its product: the massive modularity thesis. What evolution created, according to the standard account, is a suite of domain-specific mental organs containing a wealth of innate information that allows humans to solve even complex adaptive problems effortlessly and often unconsciously. Thus, we are supposed to possess a theory of mind module, an intuitive physics module, a cheater-detection module, and perhaps even some sort of innate 'moral grammar'. This last suggestion betrays the influence of nativist linguistics, and, indeed, much of the motivation for massive modularity derives from Chomskyan 'poverty of the stimulus' arguments. The *evolutionary* argument for massive modularity is that selection would have favored minds that come prewired with the sort of information that makes them more successful at solving adaptive problems. If there's an evolutionary premium on detecting cheaters, it stands to reason that selection would have endowed us with cheater-detection modules. Or so says the standard model.

Sterelny's empiricist counterproposal is that humans evolved to become adept social learners. At some point in our Pleistocene past, climatic changes encouraged a shift to a new

mode of extracting resources from the environment – social or cooperative foraging. This new lifestyle allowed for the "harvesting of high-value but heavily defended resources" as when, for example, a team of hominins banded together to hunt large game. This, however, demanded "rich, targeted ecological information … cooperation … and technology" (11). Knowledge of the local ecology and technology, in turn, required the establishment of intergenerational social learning. Neither the techniques for crafting stone tools nor the knowledge of natural history required for successful tracking and hunting could have been invented anew each generation. And, just as clearly, this information was too variable and too specific to be encoded innately. More generally, the standard model in Sterelny's view underestimates considerably the ecological, social, and even psychological variability of hominin environments and thus considerably overestimates the value of innate knowledge. If there was a *single* adaptive problem human evolution had to solve, it was the problem of novelty – the problem of creating minds that are plastic enough to adapt to whatever local circumstances they should happen to find themselves in. Learning solves this problem, but a one-size-fits-all store of innate information does not.

Sterelny's specific proposal is that hominins acquired much of their cultural knowledge by means of apprentice learning – "supervised and organized trial and error" learning that takes place "in an environment seeded with props and other cognitive tools" (36). Just as the standard model underestimates the degree of variability in early human environments, it underestimates the degree to which the informational demands of learning can be offloaded onto the environment. But, as apprentice learning illustrates, humans are inveterate 'epistemic engineers', adept at creating social and physical environments that make the learning task easier to bear. For example, a child apprentice who finds his way into an adult workshop not only has access to working models of adult tools, but also to any number of intermediate stages in the process from raw material to finished product. Thus, the child needn't perform a random search of hypothesis space to come up with the idea of a hand-axe; he need only open his eyes. The benevolence of the apprentice's learning environments thus puts the lie to claims concerning the poverty of the environing stimuli and removes much of the remaining motivation for massive modularity.

Sterelny's apprentice learning model not only offers a response to nativist psychology, it also allows him to tell a coherent, compelling, and gradualist story of human evolution. A key insight is that apprentice learning and the transmission of cultural knowledge to which it gives rise can take hold without explicit instruction. Perhaps the initial stage of human evolution was simply an increased tolerance for the presence of curious youngsters. Mere imitation learning would then have increased the likelihood that an innovation in one generation would reappear in the next, and as this cultural innovation became widespread and perhaps even integral to the hominin lifestyle, it would have introduced a new selection pressure into the mix. Individuals would now have been selected for the speed and reliability with which they were able to absorb their local culture, and as hominins became more adept at absorbing their local culture, there would have been more of an opportunity for them to make their own contribution to the cultural store—with the result being that cognitive capital would not simply be preserved but would also accumulate. And with more cognitive capital available, there would have been even more pressure to acquire it quickly and reliably. Thus, learning and the production of cognitive capital would have comprised two ends of a positive feedback loop, driving the evolution of more and

more adept social learners. As in the standard model, it is the social world that drives human evolution; only it's culture rather than social chess that is the preeminent social force.

This basic account is developed in the first two chapters and refined throughout the rest of the book. In Chapter 3, Sterelny appeals to his model to explain two of the great puzzles of paleoanthropology, namely, why Neanderthals went extinct and why anatomically modern humans took so long (perhaps 150,000 years) to become behaviorally modern. Where the standard model appeals to intrinsic cognitive capacities to explain these puzzles – Neanderthals died off because they weren't smart enough, and behavioral modernity had to await the evolution of a fully human brain – Sterelny appeals to demography. The key insight is that culture is not simply the expression of intrinsic cognitive factors, but requires the support of various extrinsic factors as well – most notably, a large enough group size for innovation to accumulate and be preserved. In Chapter 4, Sterelny provides a sketch of the 'human cooperation syndrome' and defends his model against various alternatives that downplay the evolutionary significance of cooperative foraging. In Chapters 5 and 6, he takes up the problem of free riding and attempts to show that certain forms of cooperation are less susceptible to defection and deception, information pooling and apprentice learning in particular. In Chapter 7, he takes up the cultural evolution of norms, whether moral or otherwise, and shows quite effectively that the argument for moral nativism trades on a rather weak analogy between linguistic and moral knowledge. Chapter 8 takes up the recent suggestion that the human tendency toward 'strong reciprocity' is best explained by some form of higher-level selection. Sterelny is skeptical of the more ambitious versions of this doctrine, arguing that they are motivated by a mistaken picture of the Pleistocene selective environment.

The *Evolved Apprentice* offers a compelling alternative to a view of human evolution that has come to dominate not only psychology and anthropology, but also much of philosophy. Sterelny's analyses are subtle and complex and his arguments are invariably supported by empirical data drawn from a variety of sources: the bibliography runs a good 25 pages, and few of the references are works of philosophy. Some will complain that Sterelny's account is speculative, but it is no more so – and, I would argue, a good deal less so – than the current alternatives. Defenders of the standard model will have their work cut out for them as they struggle to develop a response to Sterelny's challenge.

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