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Book Review

Explaining Human Uniqueness

A review of Kim Sterelny, The Evolved Apprentice: How Evolution Made Humans Unique. MIT Press: Cambridge, MA, 2012, 264 pp., US$37.00, ISBN # 978-0-262-01679-7 (hardcover).

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In a new and incredibly wide-ranging and ambitious work, Kim Sterelny sets out to establish a framework outlining the evolution of our cooperative and social learning capacities (amongst other things). The Evolved Apprentice, the sequel to Sterelny’s (2003) earlier Thought in a Hostile World, is without doubt a hefty interdisciplinary achievement of synthesis. Although he approaches the present subject matter as a philosopher, Sterelny states at the outset that his present work is not so much philosophy of science as it is an extended essay in the philosophy of nature: a synthetic argument that is highly empirical, the goal of which is to “develop a plausible first-approximation model of a striking natural phenomenon: the evolution of the distinctive features of human cognitive and human social life” (Sterelny, 2012, p. xi).

Creatures of Feedback

A central element of Sterelny’s overarching argument is that, rather than posit a single explanatory variable to explain human uniqueness, we should instead aim to provide a co-evolutionary account. In Sterelny’s view, human uniqueness gradually emerged from positive feedback loops involving a number of factors. Such factors, according to Sterelny’s co-evolutionary account, include cognitive aspects of the human endowment, such as our mindreading and learning adaptations, as well as more broadly (externalist) environmental aspects, such as technological artifacts and apprentice-based learning. At the heart of this picture is a rejection of “magic moment” or “key innovation” scenarios purporting to explain human cognitive and behavioral uniqueness and modernity—such as the harnessing of fire for the first time or the relatively sudden appearance of a new cognitive adaptation. Rather than posit a unitary innovation or some other watershed evolutionary event to bear the explanatory brunt, the co-evolutionary, positive feedback model set forth by Sterelny opens the way for a more gradual path to human uniqueness.
At the outset of the book, Sterelny discusses the instability of putatively important factors in human evolution. For Sterelny, group size, the scope and nature of the division of labor, degree of social hierarchy, and the overall character of intergroup interactions have all fluctuated throughout human evolution. Ergo, so the reasoning goes, not only are fixed cognitive solutions to such fluctuating realities a non-starter, but the very fluctuating nature of these factors in turn change the selection pressures that humans are exposed to over evolutionary time. Sterelny is also on board with the social intelligence hypothesis’ contention that much of our evolution has been generated via processes of “social chess.” Here, selection pressures emerge from internal psychological factors rather than external ecological factors: from the challenges of social living posed by other minds—i.e., omnipresent threats, such as deception and defection. For instance, the ever-increasing cognitive capacity for deception selects for an ever-increasing cognitive capacity for honesty-assessment in conspecifics, yielding an iterative, co-evolutionary positive feedback dynamic.

Sterelny concurs with advocates of (various versions of) the social intelligence hypothesis that this reciprocal evolutionary ratchet seems capable of explaining (at least in part) our divergence from the other great ape lineages. Having said that, however, he believes that there are at least two other important residual questions about hominin evolution that need to be addressed: firstly, how hominin cooperation manages to be profitable in the first place (and therefore more profitable than going it alone), and secondly, the extent to which the purportedly fluctuating task demands of humans were interdependent. In any case, the broader point highlighted by Sterelny is that cooperative foraging marked an important transition in hominin evolution.

Phenotypic Plasticity as Evolutionary Innovator

Sterelny draws on important work by other evolutionists such as Jablonka and Lamb (2005) and West-Eberhard (2003) in connection with his treatment of social learning, itself another important linchpin in his overall account of human evolution. Marshalling examples from other species to illustrate its potency and potential applicability in the hominin evolutionary story, Sterelny suggests that the general phenomenon of phenotypic plasticity played a key role both in the evolution of human cognitive adaptations for learning, and in paving the way for the exploration of new and adjacent habitats and niches (broadly construed). Conjoined to the emphasis on general phenotypic plasticity is the importance of various forms of cognitive scaffolding provided by the wider physical, biotic, social, and cultural environment. In its more incipient evolutionary forms, Sterelny contends that hominin learning began by exploiting the latent plasticity inherent in cognitive phenotypes. Specifically, Sterelny suggests that novel discoveries made by individual agents thereby enabled other conspecifics to imitate those trailblazers, and imitating successful innovators was additionally facilitated by the exploitation of the physical cues left as byproducts of their novel discoveries (i.e., through copying tool templates left behind). Because such novel discoveries were often fitness enhancing, they would in effect change the selective environment of the evolving lineage. Sterelny therefore envisions a process akin to the Baldwin Effect, which would gradually solidify
the acquisition of the new discovery in each generation. What began as a novel acquisition thanks to general phenotypic plasticity would, in step-wise fashion, and gradually over time, become stabilized in the population thanks to genetic assimilation—that is, via selection in favor of newly arising genetic variants that better canalize the relevant aspects of the developing phenotype, so as to make the acquisition of the novel discovery in question more reliable and efficient.

Sterelny further suggests that movement into an adjacent ecotype, for example, can effectively permit for gradual, inter-generational accumulation of innovations. With entry into the new ecotype enabled by phenotypic plasticity, the species or population in question begins to expend more time in it, hence allowing all of its members the opportunity to fortuitously discover additional innovations within that ecological context. As an upshot of the exploratory affordances brought on by the initial movement into a new ecotype by a species or population, an increasing repertoire of innovations can be gradually assembled over evolutionary time. In this piecemeal fashion, therefore, the overall lifeway of a lineage can be transformed, all thanks to a general capacity for phenotypic plasticity and what might initially have seemed like a relatively minor exploration of an adjacent habitat.

Adapted Minds, Adapted Environments

Although Sterelny highlights the integral importance of cognitive adaptations in supporting the informationally-demanding nature of social learning tasks, he nonetheless believes them to be only one side of the adaptive coin. Since he takes hominin ancestral environments to have been characterized by a substantive degree of flux, he argues that our ancestors came to depend in an important and ever-widening way on high-bandwidth, high-fidelity transmission of cultural information. Hence, the various cognitive adaptations that proximally underlie learning came to gradually adapt themselves to the informational sources in the wider environment, and vice-versa, in a co-evolutionary process. That is to say, various cognitive adaptations underlying social learning came to adapt themselves to the task demands and informational sources to which they were attuned, and various informational sources, such as parents and skillful individuals, in turn adapted themselves in various ways to the relevant cognitive adaptations in individual learners. Readers familiar with Deacon’s (1997) account of the evolution of language will see affinities between his co-evolutionary account of language and Sterelny’s account of social learning (as well as moral cognition).

All in all, Sterelny seemingly locates many of the critical informational resources for adaptive behavior in the wider environment, and just as importantly, he sees a crucial role for the epistemic engineering of the social environments on which adaptive learning depends. As those familiar with work in philosophy of mind and philosophy of cognitive science might recognize, Sterelny’s conceptualization of the epistemic engineering of, and dependency on, the wider environment of cognitive agents is indebted to the work of Clark (2008) and others of like-mind.
The Symbolic Species

In tackling the larger puzzle of what made hominins behaviorally modern, Sterelny rejects solutions to that puzzle that place sole emphasis on intrinsic cognitive capacities. Instead, the tack taken by Sterelny is to see behavioral modernity not as emerging solely from the cognitive capacities of individual agents, but through an interaction of the cognitive capacities of those individual agents on the one hand, and population structure and various kinds of informational thresholds on the other. And although Sterelny does raise the worry that the qualitative distinctness of purportedly behaviorally modern sapiens vis-à-vis more ancient sapiens might mainly be the result of an incomplete archeological record of the latter, he nonetheless affirms the consensus that there is, in fact, a qualitative difference between them.

In any case, given that he has opted to take on board the consensus that there is indeed some sort of qualitative difference that characterizes later humans, Sterelny examines one characteristic often alleged to be diagnostic of behavioral modernity: publicly observable symbols. Here his analysis is quite cautious. As Sterelny sees it, not all types of symbols indicate the presence of a behaviorally modern mind. Supposedly, in order to infer the presence of a behaviorally modern mind, at least some of the symbols it produces and interprets must be characterized by two key properties: an arbitrary relation between symbol and referent (typically), and a referent that is usually beyond the here and now. Sterelny argues that some researchers have erroneously taken other types of symbols—i.e., iconic and memetic—as indicative of behavioral modernity. In these cases, such symbols do not license the attribution of a full-fledged behaviorally modern mind. As an upshot of this, Sterelny is able to argue that various instances of symbol use, such as visible markers of group identification and other social signals, are insufficient grounds to posit a behaviorally modern mind. Moreover, Sterelny also thinks that the emergence and persistence of public symbols in the archaeological record might in principle arise as a byproduct of more straightforward demographic and economic changes. For instance, he suggests that the creation and use of physical symbols might merely be a response by agents to greater wealth differentials between individuals and more pronounced social hierarchies. Accordingly, such physical symbols could arise without them marking the emergence of fundamentally new cognitive capacities, but rather as flexible responses by agents to the exigencies of new social realities.

Cultural Supports for the Apprentice

The proposal that behavioral modernity arises through an interaction between the cognitive capacities of individual agents on the one hand, and demographic factors and broader informational resources on the other, allows Sterelny to offer a single general explanation for two puzzles: firstly, why certain human populations seemingly show the hallmarks of behavioral modernity later than others, and secondly, Neanderthal extinction. In the case of Neanderthals, Sterelny postulates that their cultural resources gradually became markedly impoverished, and with that impoverishment, their ability to cope with the niches in which they found themselves declined precipitously—and unfortunately to the
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point of extinction. Generalizing this phenomenon, Sterelny postulates that as the informational resources of a given group fall below a certain threshold, so too do their overall cognitive capacities. And in keeping with the externalist element of Sterelny’s overall framework, this allows him to suggest, for example, that when the First Australians migrated into the Sahul they suddenly ceased to be behaviorally modern. That is, they ceased to be behaviorally modern owing to a sudden and substantial loss of the demographic and cultural resources that constitute the other side of the behaviorally modern coin (with the other corresponding side being the intrinsic cognitive capacities of individual agents).

In addition to these more synchronic aspects of behavioral modernity, Sterelny’s account also provides a diachronic explanation. According to Sterelny, behavioral modernity requires high-bandwidth informational resources capable of being transmitted inter-generationally with high-fidelity, and this in turn requires a suite of underlying cognitive capacities. Crucially, those underlying cognitive capacities and the larger learning environment must be such that they permit for both the reliable maintenance of cultural information and cumulative innovation. As per his positive feedback, co-evolutionary model, all of these factors gradually co-evolved with each other during human evolution. In Sterelny’s view, it is this co-evolution between capacities for cooperation, niche construction, and information-guided foraging which pulled hominins away from the rest of the great apes.

The Informational Commons

In his discussion of trust in cooperative and learning contexts, Sterelny partly endorses the view defended by Sperber (2000, 2001). For Sperber, our cognitive capacity for metarepresentation is largely an evolutionary result of the importance of cultural learning in human life. Metarepresentation, in turn, is part of a larger cognitive complex comprising our folk epistemology, which is itself tasked with evaluating social signals for their accuracy, so as to guard against deception and manipulation (Sperber et al., 2010). However, while granting that Sperber’s picture of folk epistemology is accurate, Sterelny nonetheless thinks that it is incomplete. Rather, Sterelny believes that our folk epistemology functions not just to guard against Machiavellian manipulation and deception, but also so as to facilitate the transmission and reception of cultural information. In this regard, Sterelny sees the evolution of cultural learning and information sharing as a collection of distinct yet coevolving capacities, comprised of elements such as joint attention, theory of mind, and language, amongst others. Furthermore, because the selective regime impinging on humans puts a premium on inter-generational information flow, it thus yields selection for various cognitive adaptations that govern social learning and that appraise the honesty and epistemic reliability of information sources. Sterelny also highlights work by Csibra and Gergely (2011) on some of the various evolved cognitive capacities underpinning the cultural transmission of information, arguing that such work can be nicely integrated with his own apprentice learning model. According to Csibra and Gergely (2011), teachers are adapted for the transfer of cultural information, and learners in turn are adapted for the reception of that information.
The Quaint Holocene?

Sterelny closes out the book by briefly touching on some of the issues that arise when we consider the continuation of cooperation into the Holocene. For instance, Sterelny appears to think that a combination of factors kept cooperation stabilized once the transition into the Holocene occurred: a coopting of the psychological components that made cooperation adaptive throughout the Pleistocene; various forms of constraint emanating from a small minority of elites with the means to enforce their wills and otherwise constrain the behavior of a majority; the advent of such things as fictive kinship, all aimed at exploiting those aspects of human psychology that were designed for the small tribal worlds of the Pleistocene; and at least some degree of group selection acting as a result of competition between groups. Indeed, such considerations lead Sterelny to wonder whether the Holocene was queerer than we have realized. For there might have been some degree of group selection for cooperation, for instance, even while some decidedly anti-social individuals (and the genes underlying their anti-social traits) were being selected for simultaneously, given the rise of large societies during the Holocene and the attendant anonymity which they permitted (Mealey, 1995). Such a possibility would be consistent with the fact that intra-demic selection can, for instance, support the evolution of both altruism and free-riding (Okasha, 2001; Sober and Wilson, 1999).

Challenges for the Apprentice

In closing, there are a couple of general criticisms that can be made of Sterelny’s book. Firstly, some readers might get the impression that, in granting center stage to the transformative power of cultural learning and informational resources in the social niche of humans, Sterelny underplays or discounts entirely the potential role that genetic evolution played in granting humans their distinctive cognitive capacities. So, much of what Sterelny attributes to cultural learning and informational thresholds might instead be explained by gradual genetic evolution. Similarly, this point might be apropos to his discussion of the Neanderthal extinction and their cognitive capacities vis-à-vis sapiens. Sterelny appears quite resistant to attributing any genetically-based cognitive differences between the two species, instead opting to explain Neanderthal extinction principally in terms of his apprentice model of cultural learning. But assuming that Neanderthals and sapiens had essentially the same genetically-based cognitive endowment is questionable to say the least (e.g., Gunz, Neubauer, Maureille, and Hublin, 2010).

Sterelny also presents his apprentice learning model as superior to the modular view of the mind espoused by many evolutionary psychologists. But the foil he erects in distinguishing his own view comes dangerously close to being a straw man, if it is not a straw man outright. Specifically, various positive accounts of the modular view of evolutionary psychology (e.g., Carruthers, 2006; Barrett and Kurzban, 2006; Barrett, 2009) appear fully capable of at least in principle accommodating the explanatory targets of Sterelny’s project. And although Sterelny cannot be faulted for failing to provide a detailed proximate account of the human cognitive engine that subserves the focal phenomena covered in the book—since after all, that is not his aim—a more fleshed out proximate
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account (at least in the long-run) could very well converge on the more sophisticated modular frameworks of cognition on offer (e.g., Carruthers, 2006; Barrett and Kurzban, 2006; Barrett, 2009). Furthermore, readers interested in approaching cultural learning and cultural transmission in domain-specific terms (e.g., Tooby, 2014) will probably be disappointed. Nonetheless, and again, Sterelny should not be faulted for being silent on this, given his focus on cognitive capacity rather than cognitive implementation.

These criticisms and reservations aside, Sterelny’s book is one that will appeal to a large swathe of evolutionary-minded researchers. In today’s highly-specialized academic environment where quick results are incentivized and intellectual risk-taking is often discouraged, such a big picture, interdisciplinary task is seldom practical, let alone frequently realized. As such, Sterelny deserves much credit for taking on the challenge of integrating a large array of empirical and theoretical elements that span multiple disciplines.

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