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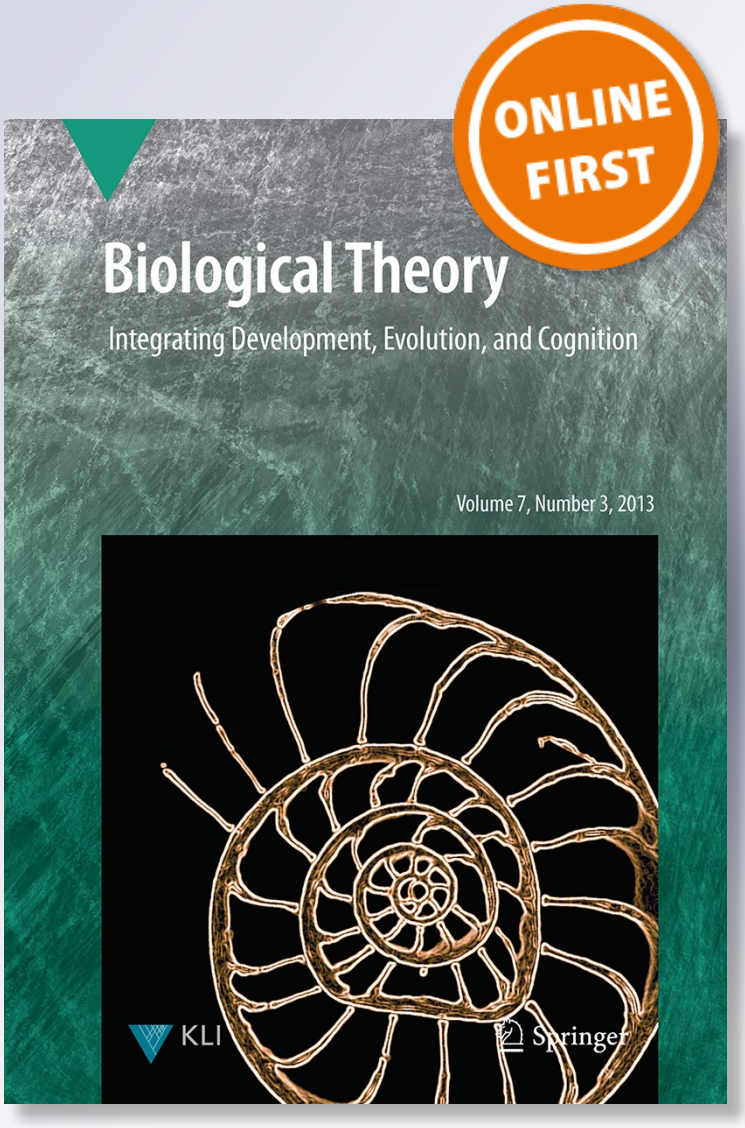

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SHORT ARTICLE

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Abstract Here I outline the argument in Kim Sterelny's book The Evolved Apprentice. I present some worries for Sterelny from the perspective of modelers in behavioral ecology. I go on to discuss Sterelny's approach to moral psychology and finally introduce some potential new applications for his evolved apprentice view.

Keywords Behavioral ecology · Evolutionary anthropology · Niche construction · Kim Sterelny

Kim Sterelny's *The Evolved Apprentice* (2012; hereafter, EA) is a tremendous book. Its scope is huge, there is a vast amount of empirical and theoretical work covered from a wide array of sciences, and there are many deep philosophical insights at many levels on the problem of human uniqueness, among others. In the recently finished introduction to an anthology on human nature I have co-edited with Edouard Machery (Downes and Machery 2013) we say: "Philosophers and other theorists interested in human nature (including psychologists, anthropologists, etc.) can no longer afford to speculate about human nature from their armchair; rather, they must get acquainted with, understand, and integrate the empirical findings that accumulate in psychology, ethology, sociology, anthropology, genetics, biology, etc. A tall order!" A tall order indeed but Sterelny delivers all this and more here. In his quest to provide a framework from within which we can explain human evolution, Sterelny incorporates work from all the fields we mention, and more. For good measure Sterelny shares with the reader the perils of drinking vodka with Stalin, how to become a Trotskyite, and Monty Python's Hungarian phrasebook skit. Impressive stuff, and in my view, how things should be done in philosophy.

I am on board with Sterelny's naturalism, I am suspicious and critical of more or less the same cast of characters as Sterelny, and I am sympathetic with most of his chosen scientific fellow travelers. None of this looks like a basis for a good critical review, but there are places where Sterelny can be pressed, and there are also arguments he makes and points he raises that can be expanded upon. Further, there is room to discuss what is next for his framework; where it should appropriately be applied in the future. Here I give a very brief synopsis of what I take to be the key ideas of the book. After that I hone in on a few issues in an attempt to encourage Sterelny to develop them more in his response to this review. Next I offer up a few possible ways in which his framework can be extended. Finally, I will reflect a little on the prospects for the integration of a project like Sterelny's into philosophy more generally.[1]

An Outline of Sterelny's Project

Peter Godfrey-Smith distinguishes two alternative approaches to explaining aspects of our behavior: internalism and

Colloquium on Kim Sterelny's *The Evolved Apprentice: How Evolution Made Humans Unique.*

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[1] This article is one of four in *Biological Theory's* Colloquium on Kim Sterelny's *The Evolved Apprentice: How Evolution Made Humans Unique* (2012). See also Gerrans (2013, this issue); Sterelny (2013, this issue); and Sutton (2013, this issue).

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externalism (Godfrey-Smith 1996). Internalists' explanations invoke mechanisms or states inside us in explanations of behavior. For example, Chomskian linguists attribute our ability to learn and speak languages to an innate grammar. Externalists' explanations prioritize features of our environment. For example, behaviorist psychologists account for our behavior, even complex behavior such as learning and speaking a language, in terms of stimuli and responses to those stimuli. Sterelny's externalist approach blends insights from behavioral ecology, niche construction theory, social learning theory, and multi-level inheritance theory, among others. Sterelny brings these resources together to help us understand that we can explain rapid changes in human cognitive competence during evolutionary history without having to resort to an array of special purpose, internal adaptive mental modules, each of which requires an account of their own evolution. His alternative to this individualist and modularist approach is a framework that emphasizes dynamic, structured environments coevolving along with several human traits, including parenting, resource provision, and cultural traits, including tools and languages. To understand what is going on here we need a brief expansion of the notion of the environment and the term "coevolution."

Environments are not all stable and permanent from the perspective of lineages of organisms or even from the perspective of the lifetime of an organism. Environments are dynamic and also, crucially, can be produced by the relevant organism. Niche construction, a concept Sterelny relies on a great deal both here and in his previous book, *Thought in a Hostile World* (2003), is an elaboration of this latter point. Beavers build dams and live in them, birds build nests and bring up their young in them, ants build their homes/cities and live in them, and each of these are cases of organisms structuring the environment that they live in. From the perspective of evolution, this constructed environment, as well as the ambient physical environment, is a potential source of selective pressure. We are big-time niche constructors, and what we contribute to our environment is not only buildings and cities but also huge reservoirs of information stored symbolically and pictorially in the form of artifacts and so on. What is important for Sterelny's view is that we should understand all of this as selectively relevant in our case. Not only does this constructed environment support learning in the short run, as Sterelny cogently argues via his apprentice learning theory; it impacts the human evolutionary trajectory. An easy way into coevolution is to think of parasite-host evolution. Parasites and hosts coevolve, because changes in the host apply selective pressure on the parasite, and vice versa. So now we have a lot of balls in the air. Environments are dynamic and can be structured by the relevant organisms, and quite drastically so by humans, and the dynamic of coevolution can be applied to environment-organism pairs, trait pairs within an organism, trait pairs between organisms in a species, and trait pairs across species, to mention a few cases.

Sterelny's explanatory target for all this machinery is human uniqueness, particularly our cognitive range, which greatly outflanks our nearest evolutionary relatives. He is not the only one who has tried to explain human uniqueness or our unique intelligence in evolutionary terms. He rejects one whole explanatory style of doing this—modular evolutionary psychology—at the outset and claims that he will not bother arguing the point: "the world does not need another interminable critique of Cosmides, Tooby, and massive modularity, and I do not give one here" (EA, p. xii). Fair enough, but he does give a critique of a whole broad swath of nativist approaches to problems such as how moral psychology and moral judgment evolve and why we are cognitively unique. Peter Godfrey-Smith has noted on more than one occasion that there are as many theories of the origins of human intelligence as there are theorists, and so Sterelny has options to pursue even if modular evolutionary psychology is sidelined. Sterelny focuses on, and then carefully sets his approach apart from, evolutionary anthropologists such as Kristen Hawkes, Sarah Hrdy, Robert Wrangham, and their colleagues. What he sees as common to these approaches to explaining the evolution of human (cognitive) uniqueness is that they are all "magic bullet" approaches. Such approaches propose that one salient trait or suite of traits has ramped up evolution in the appropriate way to produce us. Sterelny's criticism is not that any of what these theorist propose is not relevant to human evolution; rather his view is that all of it is, and more.

Against "Magic Bullets"

The evolutionary anthropologists Sterelny locks horns with are all behavioral ecologists, and he favors this approach to human evolutionary questions over modular evolutionary psychology approaches. He does also consider, refine, and respond to social intelligence hypotheses about the evolution of our unique cognitive capacities, which are proposed and defended by comparative psychologists and anthropologists of varying theoretical persuasions. The basic idea here is that human brains rapidly grew, or our cognitive capacities rapidly increased, as a result of the need to compete in an increasingly complex social environment. On one version of this approach, the strategies that lead to short-term success are Machiavellian, manipulative strategies, hence the Machiavellian intelligence hypothesis. Sterelny is on board with the general thrust of the social intelligence hypothesis, but does not side with the prominent idea that

one and only one specific social challenge is the key to rapid evolutionary change in human cognitive capacities, for example, dealing with deception. Rather, the challenges of an increasingly complex social world, all of them, impacted our evolutionary trajectory, along with changes in resource provisioning, division of labor in child rearing, all the other coevolving traits, and the stores of information we deposited in the world around us.

As I said, Sterelny rejects magic bullet approaches. He says: "Many accounts of human evolution are structured around identifying a critical breakthrough, one that explains the unique features of human life. [Sarah] Hrdy and [Richard] Wrangham exemplify this view" (EA, p. 75). For Hrdy, "cooperative breeding was the pre-existing condition that permitted the evolution of" our unique traits such as prolonged childhood and bigger brains (p. 75). For Wrangham, it was cooking: "the newly delicious cooked diet led to [early humans] evolving smaller guts, bigger brains, and reduced body hair; more running; more hunting; longer lives; calmer temperaments; and a new emphasis on bonding between males and females" (p. 75). For Kristen Hawkes the key innovation is the evolution of longevity leading to active grandmothers who provision their daughter's young.

Sterelny is right that these views are magic bullet views, but perhaps Hawkes and Wrangham are more culpable than Hrdy (e.g., 2009), who includes a bigger group of traits in her cooperative breeding complex than the other two do. Her view includes a version of the Grandmother Hypothesis, as grandmothers are part of the cooperative breeding that she discusses. Even so, Hrdy focuses on reproduction and parenting at the expense of provisioning—the collection, distribution, and preparation of food. While Wrangham does focus on provisioning, he does seem to overreach. Cooking, and its predecessor, the taming of fire, were certainly important in our evolutionary history, but that alone would not provide enough selective force to produce the suite of traits that he believes it did. I will take a little time here to respond on behalf of Hawkes, not because I think Sterelny is wrong that the Grandmother Hypothesis alone will not account for the evolution of human uniqueness, but because I have a better understanding of how she defends her view than I do of the other two.

Grandmothers and Models

First, a little more on Sterelny's take on Hawkes. Sterelny argues that Hawkes (and her colleagues) need the somewhat surprising view that hunting is signaling rather than provisioning on their own theoretical grounds. One view (another magic bullet view) about our increase in size through our evolutionary trajectory (and our increase in brain size) is that hunting is the key. Hunting introduced access to the quality food sources of meat and bone marrow and hunters killed enough to provision everyone, men, women, and children. According to Sterelny, if hunting is provisioning, then the case Hawkes makes for grandmothers' provisioning—primarily the digging up, preparing, and cooking of tubers—being required in human social groups is undermined. The complementary view about hunting is that hunters do not furnish their groups with enough resources, rather, hunting is a way of signaling that men are healthy; at least the good, successful hunters are.

A possible response from Hawkes would be that her signaling view of hunting has nothing to do with theory and everything to do with explaining the data. She would point to her empirical results, which showed (at least for the groups she was studying) that hunting did not do a good enough job of provisioning the group. So where I see Hawkes digging in is over this issue of empirical support. I also see her resisting Sterelny's reliance on coevolution, which she is very skeptical of. These two types of response are closely connected. Hawkes would want Sterelny to come at her with an empirically well-supported hypothesis about the evolution of human uniqueness. In one way, this is not a fair fight, as Sterelny is in the business of philosophy of nature, not the field-testing of behavioral ecological or paleontological models. But Hawkes' skepticism about coevolutionary thinking, I believe, is rooted in the strong empiricism of her behavioral ecology.

Compare for example Hawkes' (and Hrdy's) strong opposition to modularist evolutionary psychology. This approach is rejected because it does not produce empirically testable models in the domain of anthropology, paleontology, and other such fields. Despite the sophistication of Sterelny's evolutionary thinking (it is in a different league than modularist evolutionary psychology), there may be something here for Hawkes to run at. This kind of exchange also opens up opportunities for Sterelny. He could collaborate with modelers to start the process of producing models of some of the coevolutionary processes he points to as essential contributors to human evolution. One starting point in this kind of project could be the articulation of a model of one of the feedback loops that Sterelny invokes. As I said, whether Hawkes is right about the relevant data or not, I still agree with Sterelny that she overreaches in proposing the Grandmother Hypothesis as the one thing that explains the evolution of our unique traits.[2]

[2] Hawkes and colleagues present and defend a mathematical model of grandmothering (Kim et al. 2012) and their approach reinforces much of what I have to say here about Hawkes' approach. Their new model is a defense of grandmothering as the most important contributor to our unique evolutionary trajectory. Also, one appropriate response to this new model would be a response in kind; an alternate model that supports Sterelny's view that grandmothering is not enough.

It is worth mentioning here that Sterelny's contribution should not be viewed as one move in a very local debate in evolutionary anthropology. There are far broader issues at stake here for philosophers, anthropologists, evolutionary theorists, and many others. I return to relations between Sterelny's project and philosophy more broadly construed later after focusing on a few more details of his account in the book.

The Case Against Moral Nativism

Sterelny devotes some space to the evolution of norms and our moral psychology. His critical targets here are Mark Hauser (e.g., 2006) and his collaborators. As I have already mentioned, early on in the book Sterelny says that he is not going to offer another "interminable" critique of modular evolutionary psychology. I think he does offer a criticism of modular evolutionary psychology. His critique is not interminable, I agree, and does not focus exclusively on Cosmides and Tooby as many others have, but it has bite—perhaps much more bite than other critiques of this approach on offer. I would go further: Sterelny's criticism of modular nativism (developed both here and earlier in *Thought in a Hostile World*) is devastating and comprehensive. There are two reasons this is so: First, Sterelny gets at the common take-off point for all modular evolutionary psychology views, broadly construed, and that is poverty of the stimulus arguments. Second, Sterelny gives an alternative explanation for how the relevant cognitive suite—folk psychology, moral psychology, and so on—evolved and persists. The explanation is his apprentice learning account plus his account of evolution via constructed and structured environments and coevolution of trait complexes. On my reading, Hauser et al. are part of evolutionary psychology broadly construed, their view is a nativist, and, at least implicitly, a modularist view. Hauser tends to talk in terms of instincts rather than modules but the intent is the same.

There are a few details in Sterelny's discussion of moral psychology I want to pick up on. First, in tackling the moral nativists, Sterelny moves very quickly from a discussion of disgust to the notion of reflective morality (2012, pp. 156–157). I thought that the hanging fruit was that disgust is non-reflective, very fast, etc., just like your standard putative innate responses, but also *incredibly culturally local* and *massively varied*. From this alone we could find strong support for the conclusion that disgust does not have to be subserved by an evolved module (or collection of evolved modules). This is not the option Sterelny takes. Maybe because it is too easy or obvious, or maybe because he does not think it follows. Instead, he moves to a discussion of collective moral reasoning and says that is our best example of reflective moral reasoning (as opposed to reactive moral judgment) (EA, p. 157). If Sterelny thinks that what I take to be an obvious move does have any bite against moral nativists, he does not say so directly.

Second, in 2007 Sterelny (2007) presented arguments against Hauser's moral instinct view (precursors of the developed account in this book) that I thought were very similar to Shaun Nichols' (2005) arguments against Hauser on moral judgment. Neither of them were aware of each other's arguments at the time. One weakness in Nichols' attack on Hauser is that the positive story he proposes sounds very much like modular evolutionary psychology, but pushed back to the emotions. Sterelny in this book now acknowledges Nichols (see, e.g., 2004, 2005), and other philosophers working in naturalist moral psychology, but more than that, he says he is "allied with" their Humean revival. He is, but he adds a great deal to Nichols' story. Arguing, as Sterelny does, that we learn our morality via apprentice learning is quite a radical departure from the individualist approach of the new Humeans. The very focus on learning and particularly learning via structured environments sets Sterelny's views on moral psychology apart from his Humean, and oddly still somewhat nativist allies. The move away from explicit learning via language to a pattern matching or prototype driven view sets him even further apart.

New Applications for the Apprentice-Learning Model

As I have pointed out, Sterelny pushes the apprentice-learning (with "pooled" information) model into areas you would not expect. Not just spear making and food preparation, but learning moral judgment is included in the model's explanatory scope. This opens up a lot of possibilities. One that comes to mind is understanding science. Thomas Kuhn's normal science notion is arguably one of his most important contributions to the philosophy of science. Sterelny provides a way of spelling out how scientists learn their trade in normal science: they do so via apprentice learning aided by pooled information. There is a fair amount of work, usually coming from historians or sociologists of science, treating science as a practice, but Sterelny's apprentice learning model potentially adds much more theoretical weight to these views of science. If we can acquire morality without explicit learning via language, perhaps we can acquire components of scientific knowledge that way too.

A framework that would account for the acquisition and maintenance of our huge variety of beliefs, religious, micro-cultural, and even downright self-defeating and stupid, would be very helpful. Such a framework could

perhaps account for our common or garden beliefs, rather than the "p's" of epistemology. Comparative psychologists, for example, Joe Hendrich (see, e.g., Hendrich et al. 2010), chart the territory well for us, illustrating the vast variety of beliefs humans hold, but do not supply satisfactory mechanisms or accounts of what we could call belief fixation in a culture. I use the term belief fixation very loosely here. The kinds of beliefs I am interested in do not join the cognitive furniture via anything like Fodor's belief fixation model in the *Modularity of Mind* (1983). Many of them are by all reasonable lights plain false, and hardly any arrive as a result of reasoning or argumentation. The Fodorian model, which is something like internalized logical empiricism, does not transport well out of the individual context to the social and cultural context. Sterelny's apprentice learning plus information pooling does a much better job. If Sterelny is right that we have all evolved the relevant hardware for apprentice learning (and I think he is), then all of our contemporaries and those in recent history gain and fix their various beliefs and belief systems the Sterelny way. There are downsides to this that we see all around us; epistemic policing (with any kind of real normative bite) is minimal and, to the extent it exists, is highly culturally local.

Sterelny's Contribution to Philosophy

I mentioned earlier that Sterelny tackles debates in evolutionary anthropology that might not be familiar to most philosophers. Sterelny's sparring with Hauser brings things closer to home, as many philosophers, including those that Sterelny cites, are heavily engaged with the empirical literature on moral psychology. But Gilbert Harman, Steve Stich, John Doris, Sean Nichols, and Richard Joyce, etc., have still not convinced the field as a whole that what they do is core or mainstream philosophy. Part of the issue is just that they are all self-proclaimed naturalists. Perhaps more importantly, part of what is at stake here is the plain difficulty that goes along with absorbing empirical results and theoretical frameworks from the various sciences; this hard work is a prerequisite for the kind of philosophy these folks trade in. In the 1980s and early 1990s, Wason or Tversky and Kahneman type results in the psychology of reasoning, or Nisbett and Wilson type results in social psychology, were known about by very few philosophers. Those who knew about them, worked very hard to impress upon their colleagues the devastating implications of this empirical work for much work in philosophy. Not many people were keen to listen, and certainly very few thought that "devastating" was the right description—"mildly interesting" was usually thought more suitable. Now, pretty much every epistemologist, philosopher of psychology, and philosopher of science is familiar with these lines of research in psychology. Moral psychologists are more likely to be familiar with social psychology and the rest of us with empirical work on reasoning. The debate over "devastating" vs. "mildly interesting" still rages but there is a debate, in philosophy, among philosophers. Sterelny points us towards a huge body of empirical and theoretical work that could well have a devastating impact on hard-held philosophical views, but he is one of very few pioneers in this domain. He is where those bearers of the news from Tversky and Kahneman et al. were in the 1980s. Given the huge amount of catching up most of us would have to do in evolutionary anthropology, coevolutionary theory, niche construction theory, and so on, perhaps there will not be many takers for what Sterelny is offering. I think that is the wrong attitude. I hope to have demonstrated in my brief discussion here that Sterelny has shown how we can radically reshape our view of learning across many domains, morality, nativism, and a host of other issues that are and always have been core issues in philosophy. The best way to begin catching up with Sterelny in order to join with him in tackling these issues is to read this important book.

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