

Bering proposes that human beings evolved a cognitive system dedicated to the belief in an afterlife. In support of that claim, he refers to experiments showing that young children often make continuity claims – they assert that mental processes, notably thoughts, feelings, and desires continue after death – whereas older children are more likely to deny their continuity. Bering concludes that this developmental pattern is consistent with the early functioning of the proposed cognitive system but not with the alternative hypothesis of religious teaching. On that hypothesis, claims that mental processes continue after life would be more frequent among older as compared to younger children.

We think the developmental pattern is more complex than Bering allows and that, on close examination, it underlines a crucial role for religious teaching. First, two recent studies indicate that continuity claims increase rather than decrease with age, both in Spain (Harris & Giménez 2005) and in Madagascar (Astuti & Harris, submitted). The most plausible explanation of this age change is that as they get older, children are increasingly likely to encounter and assimilate afterlife beliefs in their community. A likely explanation for the retrenchment of such beliefs reported by Bering is that children come to differentiate between the fate of human beings and other animals, including mice (the focus of Bering's research): they learn that human beings enjoy an afterlife whereas mice do not.

Still, Bering could reasonably insist that children start out with a global and innate set of afterlife beliefs, even if religious teaching reinforces or denies their application to particular creatures. However, other evidence undermines this defence. Astuti and Harris (submitted) report that 7-year-old Vezo children in Madagascar generally assert that all processes that sustain or are sustained by life, including cognitive and emotional processes, cease at death. The most plausible explanation for this finding is that Vezo children have considerable first-hand experience of the biology of death because they observe and actively participate in the slaughter and dismemberment of animals, and they routinely attend funerals where they observe the persistent immobility of the corpse and experience the stench of decomposition. On the other hand, they are given no explanation of the meaning of the various ancestral and burial rites that they witness (Astuti, forthcoming a).

Third, we note that other developmental findings cast doubt on Bering's simulation-based proposal that children find it difficult to conceive of the absence or cessation of mental processes, including thinking, because they have never experienced any such cessation. A series of experiments by Flavell and his colleagues has shown that young children readily conceive of an absence of thinking. Indeed, they do so in circumstances where adults would typically assume that thinking is all but inevitable. For example, when asked whether it is possible to sit quietly and entertain no thoughts for a sustained period, the majority of 5-year-olds assert that it is possible (Flavell et al. 2000).

Finally, we note that whatever disposition children and adults show toward afterlife beliefs, their assertion or denial of those beliefs is quite context-sensitive. When asked about death in the context of religious practices, beliefs in continuity are activated; when asked about death in the context of medical or secular practices, beliefs in discontinuity are activated (Astuti & Harris, submitted; Harris & Giménez 2005). This context-sensitivity is mirrored in everyday life: A dead corpse may be prepared for burial with no expectation that it retains sentience; the dead person, by contrast, may well be attributed thoughts and feelings (see Astuti [forthcoming b] for an ethnographic illustration from Madagascar).

In sum, although we do not dispute the claim that children and adults are prone to think in a dualistic fashion, we doubt that such a tendency reflects an evolved system dedicated to afterlife beliefs.

Folk psychology meets folk Darwinism

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Abstract: The fact that beliefs in the supernatural are useful to people who hold them does not necessarily mean that these beliefs confer an evolutionary advantage to those who hold them. An evolutionary explanation for any biological phenomenon must meet rigorous criteria, but the facts in this case, even when taken at their face value, fall well short of these criteria.

Evolutionary adaptation is a special and onerous concept that should not be used unnecessarily, and an effect should not be called a function unless it is clearly produced by design and not by chance.

—G. C. Williams (1966)

Bering's proposal has two main facets. The first deals with evidence that purports to show that beliefs in the supernatural are advantageous to those who hold them. For the sake of argument, we will take this evidence at face value so we can focus on the second facet of Bering's proposal, which consists of his hypothesis that such beliefs arise from "an organized cognitive 'system' dedicated to forming illusory representations" that has "evolved in response to the unique selective pressures of the human social environment" (target article, sect. 1, para. 5).

Bering claims that his hypothesis is "grounded" in the theory of natural selection, but provides no explanation whatsoever as to how. This is unfortunate, because such an exercise would have made it self-evident that an evolutionary hypothesis is neither warranted nor justified in this case. Although Bering's hypothesis is intuitively appealing, it is invalid because it arises from a misapplication of the theory of natural selection. Given the evidence at hand, invoking the theory of natural selection to explain the prevalence of beliefs is about as scientifically valid as invoking the theory of gravitation to explain the attraction between two people.

Briefly, for a given trait to evolve through natural selection, individual organisms with the trait must have greater fitness, that is, be more likely to survive and reproduce. Specifically, this means not only that a given trait must be heritable, but also that the trait must either increase the fitness of the organism by itself or must be associated with (or, technically speaking, be pleiotropic to) one or more of other heritable traits that do so (for a more rigorous treatment of the subject, see Futuyma 1998).

In the present context, the aforementioned evolutionary principles require not just that the belief in the supernatural be a heritable trait, but also that those in the relevant previous generations who held such beliefs were more likely to have survived and reproduced. Bering does not even begin to establish either the heritability or the increased fitness, much less both. The closest he comes to doing this is to argue that the beliefs in the supernatural are useful to people who hold them. But sociological utility is a far cry from fitness. In other words, the fact that those who hold such beliefs fit in better from the social standpoint does not mean that they have greater fitness from the evolutionary standpoint. Of course, our objection here is not that Bering fails to use insider's jargon when referring to evolutionary concepts, but that he confuses non-evolutionary concepts for evolutionary ones. In as much as he infers natural selection based on sociological utility, Bering is indeed confusing utility with fitness. As to heritability, the closest Bering comes to addressing it is to argue that "Kindergartners understood that various biological imperatives . . . no longer applied to the dead mouse" (sect. 2, para. 2), which hardly lays the issue to rest.

Of course, natural selection is not the sole mechanism of evolution. Mutation, the ultimate source of variation on which natural

selection can act, can alone result in evolutionary change over time. While natural selection is the driving force behind all adaptive evolution, non-adaptive processes such as genetic drift, meiotic drive, and a few other forces can also lead to evolutionary changes (Futuyma 1998). However, Bering's hypothesis would not be any more valid if it were based on non-adaptive evolutionary forces.

To be fair, Bering is hardly alone in misapplying the theory of evolution to explain higher cognitive functions. Since all living things are products of evolution, there is a widespread tendency to treat evolution as a default explanation for all things biological. Although this is understandable, it is also scientifically naïve. Of course, that is not to say either that cognitive phenomena have no basis in evolution or that they inherently defy evolutionary explanations. Rather, it is to emphasize that any evolutionary explanation for a given biological phenomenon, cognitive or otherwise, must at a minimum demonstrate that the relevant trait is heritable and, in cases where natural selection is invoked, that it increases fitness. The genuine difficulty of studying the evolutionary basis of cognitive phenomena is that both heritability and fitness effects are exceedingly hard to establish for these phenomena. This does not mean that no evolutionary explanations for such phenomena are to be ventured, but that they are to be ventured with appropriate caution and adequate groundwork. Clearly, Bering's hypothesis is burdened with neither.

In a sense, evolutionary biology of higher cognitive phenomena is like astrophysics or paleontology, where direct measurements are often all but impossible, and experimentation is harder. In such cases, one has no choice but to substitute tests and measurements with informed speculation, "informed" being the operative word. But in such an event, the speculative aspects must not only be acknowledged, but highlighted, and the underlying risks and implications of the substitutions must be carefully assessed. Bering does none of this. In light of all these problems, it is surprising to us that Bering chooses to couch his hypothesis in the onerous theory of natural selection and not some less exacting and more suitably ambiguous concept like cultural evolution (see, e.g., Mesoudi et al. 2006; Richerson & Boyd 2005). Why must it be natural selection and why won't a less demanding theory do? Bering does not say.

Ultimately, in order to establish that his hypothesis has any relation to the theory of natural selection, Bering must, at a minimum (1) demonstrate heritability and fitness effects for the belief system in question, (2) prove that these parameters are somehow irrelevant to his hypothesis, or (3) show that our formulation of the minimum requirements of the theory of natural selection is incorrect. Failing this, he must concede that his hypothesis has no basis whatsoever in evolutionary theory.

Natural selection and religiosity: Validity issues in the empirical examination of afterlife cognitions

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Abstract: Bering's target article proposes that the tendency to believe in an afterlife emerged (in evolutionary history) in response to selective pressures unique to human societies. However, the empirical evidence presented fails to account for the broader social context that impinges upon researcher-participant interactions, and so fails to displace the more parsimonious explanation that it is childhood credulity that underlies the acquisition of afterlife beliefs through cultural exposure.

As part of a fascinating case for a folk psychology of souls, Bering argues that believing in an afterlife is an evolutionarily inherited human tendency. However, although he provides much illustrative evidence, it is largely circumstantial in nature. Bering fails to take account of threats to validity that inevitably arise when researching such speculative and sensitive cognitions as people's beliefs in their own psychological immortality.

To support the claim that afterlife beliefs are innate, Bering cites research where child participants are asked to describe the ongoing thoughts of a recently killed (fictitious) mouse (Bering & Bjorklund 2004). The assumption inherent in this work is that as children have not yet developed explicit religiosity, their quasi-religious views are more likely to be innate than acquired. Thus, when the children respond that the animal continues to have thoughts and wishes, the researchers conclude that this indicates their belief in an afterlife. However, the external, internal, and construct validity of such research is highly questionable.

External validity is threatened because children's views on dead mice are not clearly generalizable to their beliefs about the immortality of souls. For one thing, children's well established capacity to engage in counterfactual thinking (Riggs & Peterson 2000), which underlies their ability to engage in pretend play, may lead them to think differently about dead mice in experimental vignettes compared to dead people in real life. Internal validity is threatened by a failure to include a control condition, wherein children's beliefs about the agency of inanimate objects in general might be probed. The attribution of agency to inanimate objects has been observed in both children and adults (Barrett & Johnson 2003). Thus, it is impossible to determine whether children's comments about the "thoughts" of dead mice are any more profound than similar comments about chairs, cars, or computers.

As is typically the case in research with children, construct validity is threatened by the likelihood that responses to experimental questions will be influenced by the experimenters' seniority in age and status. The fact that children make what for them are counter-intuitive inferences in order to accommodate the assumptions implicit in (adult) researchers' odd questions is long documented in psychology (e.g., McGarrigle et al. 1978; cf. Hilton 1995). In this case, perceiving the adult to be an authority figure, child participants may have inferred from the questions asked that it is *to be expected* that the mouse's mind continue to function. As it cannot be guaranteed that participants genuinely hold the beliefs attributed to them, the question of whether such beliefs might be innate becomes moot.

Rather than postulating an innate propensity to believe in souls, a more parsimonious theory might invoke the evolutionary benefits of credulity among children. Given the need for guidance to navigate the treacherous environments that characterize early childhood, it is likely that children's unquestioning faith in whatever adults tell them is highly adaptive (Dawkins 2003). As virtually all young children are presented (directly and indirectly) with the idea of the immortality of souls, it should be unsurprising if such a notion becomes widely believed. It is this propensity for credulity that represents evolution's legacy to spiritualism, and not an innate propensity to intuit the existence of an afterlife per se. By relying on fewer antenatal inputs, theories of innate credulity are more parsimonious than ones of innate beliefs about existence. Indeed, researchers who infer an innate belief in afterlives in the absence of sufficient evidence could themselves be accused of holding unsubstantiated beliefs in a *beforelife*, namely, the sense in which an individual's personhood "exists" (such that it is endowed with fundamental beliefs) before he or she is even born.

However, Bering may well be correct about the reasons why many *adults* develop strong beliefs in afterlives (which are then transmitted to credulous children). Nonetheless, gathering empirical evidence here is also problematic, as problems arising from experimenter-participant interactions are not