



*To arrive at the edge of the world's knowledge, seek out the most complex and sophisticated minds, put them in a room together, and have them ask each other the questions they are asking themselves.*

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## 2014 : WHAT SCIENTIFIC IDEA IS READY FOR RETIREMENT?

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### Human Evolutionary Exceptionalism

Humans are biologically exceptional. We're exceptionally long-lived and exceptionally cooperative with non-kin. We have exceptionally small guts and exceptionally large brains. We have an exceptional communication system and an exceptional ability to learn from other members of our species. Scientists love to study biologically exceptional human traits such as these, and that's a perfectly reasonable research strategy. Human *evolutionary* exceptionalism, however—the tendency to assume that biologically exceptional human traits come into the world through exceptional processes of biological evolution—is a bad habit we need to break. Human evolutionary exceptionalism has sown misunderstanding in every area it has touched. Here are three examples.

*Human niche construction.* Humans have exerted biologically exceptional effects on their environments. In our evolutionary past, these so-called niche construction effects occasionally created the necessary and sufficient condition for natural selection: a generationally persistent covariance between genes and fitness. For example, earlier hominins' experimentation with cooking (which required the generationally persistent availability of culturally transmitted knowledge on how to control fire) made their food more digestible. Consequently, genetic mutations that shrank the human gut, teeth, and jaw muscles were naturally selected because they enabled resources to be re-assigned to the construction of new adaptive faculties (including cognitive ones).

For years, Niche Construction theorists have argued that standard evolutionary theory cannot account for such interactions between humans' culturally mediated environmental effects and natural selection. In response, they have promoted niche construction as a "neglected evolutionary process" that collaborates with natural selection to direct evolution. However, they obtain persuasive force for this argument by re-defining what evolution is. Humans' niche construction activities have undoubtedly exposed new covariances between genetic variation and fitness during human evolution, but those activities have neither created that variation nor filtered it, so they don't constitute an evolutionary process. Culturally mediated human niche construction is real, important, sometimes evolutionarily significant, and certainly worthy of study, but it doesn't compel a revision to our understanding of how evolution works.

*Major Evolutionary Transitions.* Over the past three billion years, natural selection has yielded several pivotal innovations in how genetic information gets assembled, packaged, and transmitted across generations. These so-called *major evolutionary transitions* have included the transition from RNA to DNA; the union of genes into chromosomes; the evolution of eukaryotic cells; the advent of sexual reproduction; the evolution of multicellular organisms; and the appearance of eusociality (notably, among ants, bees, and wasps) in which only a few individuals reproduce and the others work as servants, soldiers, or babysitters. The *major evolutionary transitions* concept, when properly applied, is useful and clarifying.

It is therefore regrettable that the concept's originators made category mistakes by characterizing two distinctly human traits as outcomes of major evolutionary transitions. Their first category mistake was to liken human societies (which are exceptional among the primates for their nested levels of organization, their mating systems, and a hundred other features) to those of the eusocial insects because the individuals in both kinds of societies "can survive and transmit genes . . . only as part of a social group." This is an unfortunate case of science by analogy: The fact that humans are adapted for living in social groups does not imply that they, like ants, bees, wasps, and termites, need groups to reproduce. If the chemistry, timing, and lighting are just right, any human male and any human female, plucked from their social groups at random, can manage to convey genetic information to the next generation just fine.

Their second category mistake was to hold up human language as the outcome of major evolutionary transition. To be sure, human language, as the only communication system with unlimited expressive potential that natural selection ever devised, *is* biologically exceptional. However, the information that language conveys is contained in our minds, not in our chromosomes. We don't yet know precisely where or when human language evolved, but we can be reasonably confident about *how* it evolved: via the gene-by-gene design process called natural selection. No major evolutionary transition was involved.

*Human Cooperation.* Humans are exceptionally generous, particularly toward non-relatives. We cooperate with strangers when we'd be better off in the short term by competing. We donate anonymously to charities. We accomplish group projects even though all participants surely recognize that they would be better off, at least in the short run, by loafing and letting the others do the work. We share with needy strangers even when we know they will never repay us. We praise generosity, and denounce stinginess, even when the behaviors in question have not affected us directly.

In the past, all of these cooperation-related phenomena spent time on evolutionary scientists' lists of "unsolved puzzles about human cooperation." The good news is that scientists have already succeeded in nudging many of them toward the "solved puzzles" list. The bad news is that some scholars have gone in the opposite direction: They have moved these problems onto the list of "mysteries"—problems so perplexing that we should abandon hope of ever solving them within the standard inclusive-fitness-maximizing view of natural selection. Their mystification has led them, at turns, to invoke evolutionary explanations that are inappropriate for species in which all individuals reproduce, to propose new evolutionary processes that are not evolutionary processes at all (but rather, proximate behavioral patterns that *require* evolutionary explanations), and to presume without justification that certain quirks of modern social life were selection pressures of our deep evolutionary past. Explaining the exceptional features of human cooperation is challenging enough without muddling the problem space even further with conceptual false starts, questionable historical premises, and labyrinthine evolutionary scenarios.

Human evolutionary exceptionalism is counterproductive for science. It leads to internecine squabbles. Correcting the misconceptions that follow in its wake distracts specialists from more productive work. Finally, it confuses non-specialists who lack the time to sort through these controversies for themselves. It's good to be curious—and, sometimes, even querulous—about how our biologically exceptional traits evolved, but we should resist the idea that evolution made up new rules just for us.

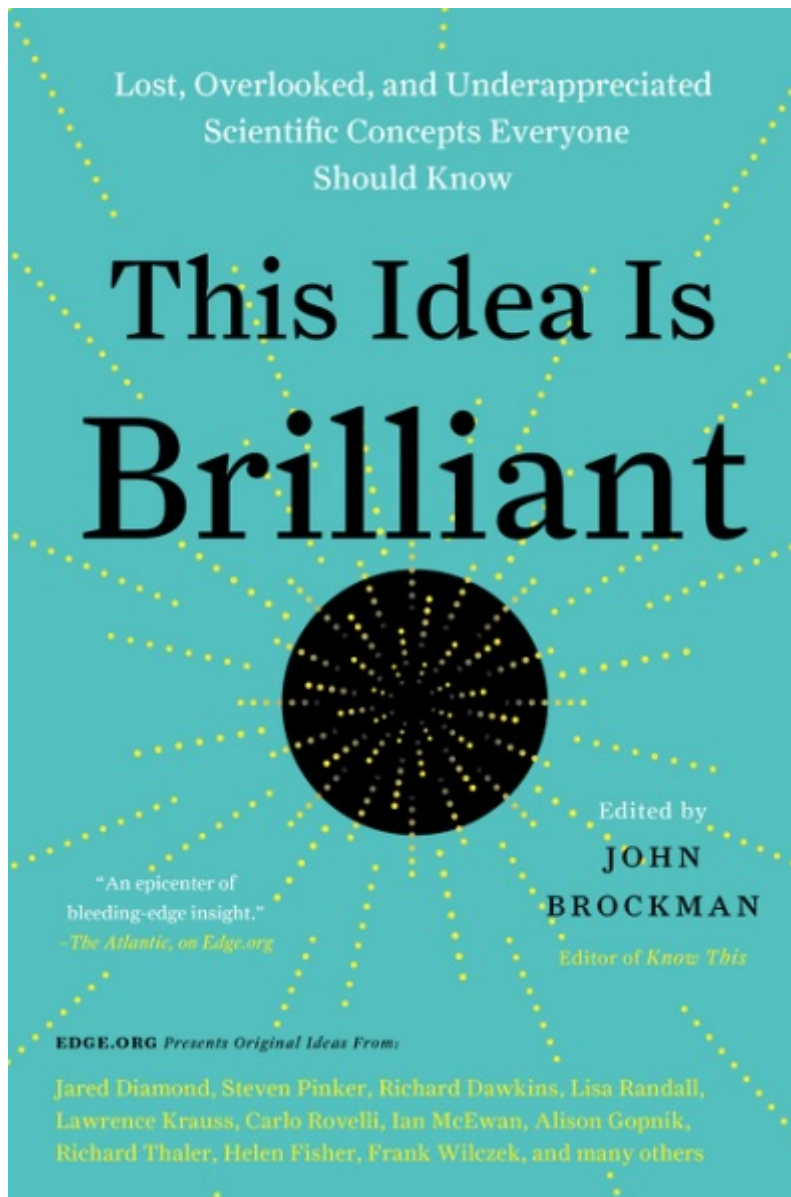
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