Does evolution explain human nature?

Joan Roughgarden

Not yet. . .

and almost surely never. Although human nature, like biological nature generally, results from a continuing process of evolution, the question before us is whether present-day evolutionary science explains human nature. Does it explain our religious beliefs and moral commitments as convincingly as it explains our more prosaic traits like, say, why we have four arms and legs instead of six? Obviously not. Evolutionary science has much more work to do before it can explain our more abstract traits. But how much more?

Religious beliefs, moral commitments, consciousness, and the free will to do right and wrong emerge in a social context. These traits are not properties of an individual like the ability to hear high notes or to taste bitter flavors. Social behavior develops as individuals acquire experience with one another. It is a system of traits that forms when individuals interact. A white-crowned sparrow learns its song by listening to others as it grows up. Unlike its vocal chords, a bird's song is a collective property belonging to its group.

What makes social behavior hard to understand is that interaction takes place *during* development rather than after it. By contrast, consider some socially important physical traits, like green or gray skin color in frogs. These traits are formed not during social interaction but *prior* to it. In wet years, with green moss on the trees, green frogs are more camouflaged and are able to fight longer for space than gray frogs before seeking cover from predators, whereas in dry years, gray frogs are able to defend their territory longer. The competitive balance point between green and gray frogs changes from year to year, depending on the year's rainfall, favoring green frogs in wet years and gray frogs in dry years. At each year's balance point, the frogs occupy all of the living space according to a color ratio such that a newly arriving frog of either color has no advantage over another frog. Thus, the colors influence the outcome of territorial interactions, but the colors themselves are not generated by those interactions.

The competitive balance between socially important traits was studied by the late John Maynard Smith, a theoretical biologist who introduced mathematical game theory into evolutionary biology. Maynard Smith applied his analysis to the evolution of social behavior among competing individuals, assuming that their behavioral inclinations or "strategies" were already formed prior to their interaction. He famously discussed the evolutionary outcome of competition between "altruists" who interact with "selfish" individuals, as though the traits of altruism and selfishness were permanent characteristics of the actors, just as green or gray body coloration might be for a frog.

But in most social behavior, how an organism acts, whether it behaves altruistically or selfishly, depends in large part on its experience with others while maturing. Moreover, the Maynard Smith approach stipulates that behavioral interactions are inherently competitive because he considered their outcome to be a competitive balance point.

To go beyond the limitations of Maynard Smith's model, my students and I have introduced the idea of "social selection." Our approach decomposes the evolutionary theory of social behavior into two levels or "tiers." The "lower" tier analyzes the development of behavioral actions using game-theory techniques but without Maynard Smith's assumption of inherently competitive behavior; we employ criteria for both cooperative and competitive endpoints. The "higher" tier analyzes the evolution of behavioral tendencies using population-genetic techniques.

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With this approach, we have been able to show, for instance, that sexual conflict is not inevitable in the relationship between males and females in nature, as some evolutionary biologists claim, and we have demonstrated that some forms of sexual intimacy may be interpreted as mechanisms to enable friendship and teamwork among animals. All in all, our research suggests that the "selfish-gene" metaphor for evolution is misleading and inaccurate.

Still, the question remains whether evolutionary science, even after these and other improvements take root, will ever explain features of human behavior such as spirituality, morality, consciousness, free will, and so forth. But why stop there? Will evolutionary science ever explain most of the features of any species?

This question forces us to confront our own modest place in nature. The natural world is infinite, and even if the aggregate number of people who have ever lived were scientists working 24/7 on evolutionary research, their aggregate effort would be finite, leaving a still infinite set of evolutionary mysteries. Do we know why the chameleon evolved to catch bugs with its tongue instead of sneaking up and pouncing on them? No. Will we ever? Probably not. Do we know why and how humans have come to possess a sense of morality? Not yet. Will we ever? Almost surely not.

Scientific research requires the expenditure of scarce time and money, and for most people, the value of discovering the origins of our moral sense is dwarfed by the health benefits of curing cancer or the environmental benefits of conserving tropical forests. Questions about the evolution of morality seem destined to linger indefinitely on some back burner.

There is nothing inappropriate about asking how we evolved our sense of morality or any other aspect of human nature. Indeed, I believe that investigating how evolution occurs is a sacred calling and that our appreciation for every aspect of human life is enriched by an evolutionary perspective. But some parts of this enterprise are more practical than others—and also are far more likely to succeed.

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