and offering an inspirational glimpse into a very new kind of social science that may exist in the future. Our only concern is that readers may run with the ideas without thinking carefully about each step.

Evolutionary theory and the riddle of the universe

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Abstract: An effective restructuring of the social sciences around the evolutionary model requires that evolutionary theory has explanatory power with respect to the spread of cultural traits: The causal mechanisms involved should be structurally analogous to those of biological evolution. I argue that this is implausible because phenotypical consequences of cultural traits are not causally relevant to their chances of "survival."

That there exists a certain likeness between the evolution of species and the manner in which cultural traits are propagated, stands beyond doubt. Before we jump to conclusions and start remodeling the social sciences according to the evolutionary blueprint that biology provides, however, it is important to have a clear indication that the evolution of cultural traits is not merely similar to biological evolution, but structurally analogous to it. Therefore, the important question is not whether models based on evolutionary theory are roughly *descriptive* of the spread of cultural traits, but whether the evolutionary model has *explanatory power* with respect to the process by which that spread occurs. And for this to be the case, the model has to get the causal mechanisms of the process right.

In the story "The Riddle of the Universe and Its Solution," Czerniak (1981) describes a situation that would allow for a positive verdict on this score. It is useful to examine this situation, because it rather glaringly differs from the situation that we find ourselves in with respect to the propagation of ideas and other cultural traits. Czerniak imagines that, for humans, there exists an idea analogous to a Gödel sentence for computers. People who have this idea go into a catatonic state from which they are unable to recover. The propagation of such an idea (or rather, the process by which it goes extinct) would be truly analogous to biological evolution. The reason for this is that the causal system at work would be structurally analogous to selection of genes by biological evolution: A phenotypical consequence of having the Gödel idea (namely, going into catatonic state) is itself responsible for its lower chances of being propagated – just as the phenotypical properties associated with genes may cause their bearers to go extinct.

The fact that this story strikes us as science fiction suggests that, in reality, it does not work like this. At least on the face of it, the propagation of ideas and other cultural traits does not involve selection on their phenotypical properties (if that term is at all well defined). Ideas, artifacts, and other cultural traits are subject to changing levels of popularity, sometimes as a result of their becoming more or less useful over time, sometimes because of other factors. But surely the decline in popularity of, say, Dixieland music is not due to any phenotypical consequences of liking Dixieland music. In point of fact, liking Dixieland music does not prevent one from giving away Dixieland records for free, however much the decline in popularity of such records in the human population may resemble the evolutionary process by which genes become infrequent in a population of animals. In contrast, such a connection does exist between having a gene and being able to propagate it (namely, if the gene is bad for you, you die before you get the chance to propagate).

Mesoudi et al. attempt to anticipate the problem of identifying such causal mechanisms by stating that "just as Darwin formulated his theory of evolution with little understanding of genes or Mendelian inheritance, a theory of cultural evolution likewise does not necessarily have to rest on the existence of memes or particulate cultural transmission" (sect. 1, para. 12). But this confuses an ontological condition with an epistemological one. The relevant issue here is not whether Darwin *knew* about the mechanisms of inheritance via genetics; the relevant issue is that such mechanisms *exist* and are *causally relevant* to the biological phenomena that we want to explain. In other words, what convinces us of the usefulness of the evolutionary framework in biology has nothing to do with the epistemological position Darwin was in when working out the principles of evolutionary theory; it has to do with the fact that his theory, by and large, appears to be true.

The biological sciences are organized around evolutionary theory because evolution has causal relevance for each of the disciplines involved. For a similar organization of the social sciences to be an effective restructuring, rather than a case of plastic surgery, it is important to show that such causal relevance also exists for the various disciplines that make up the social sciences. Hence, the mechanisms by which cultural traits are propagated cannot be sidestepped as easily as Mesoudi et al. suggest, and they would, therefore, do well to offer some convincing arguments for the existence of such mechanisms. Otherwise our restructured social science, modeled after the biological plan, will be like a toy model of a Boeing 747. It will look just the same, but it won't fly.

It is not evolutionary models, but models in general that social science needs

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Abstract: Mathematical models are potentially as useful for culture as for evolution, but cultural models must have different designs from genetic models. Social sciences must borrow from biology the idea of modeling, rather than the structure of models, because copying the product is fundamentally different from copying the design. Transfer of most cultural information from brains to artificial media increases the differences between cultural and biological information.

Mesoudi et al. make a plea for the use of evolutionary models, developed for analyzing genetic evolution, in analyzing cultural influence and change. Indeed, they provide many illuminating examples of the usefulness of modeling in social sciences, but the connection to mathematical models of biological evolution is often indirect, sometimes only metaphorical. For example, in section 2.1.2 the authors cite Mace and Pagel (1994), who treat cultural traits as equivalent to biological characters, with independent instances of cultural change occurring when a cultural trait is invented, acquired from another culture, changed, or lost. This situation is very different from biological evolution, though, where "acquired" is not a possibility. Further, cultural traits are not like Mendelian units, independent of one another – they influence one another, they have different sizes and different nestings, and, as Mesoudi et al. note, they are frustratingly difficult to define.

Under these conditions, it is surprising that models developed to analyze biological evolution are also useful for looking at cultural development. But the value of the models may stem not so much from their link to evolutionary theory as from the way that they force investigators to define terms, use consistent categories, and in general discipline their data. Mathematical