

Book Review

Bart de Boer^{*,**}

Universiteit van Amsterdam

Rijksuniversiteit Groningen

Evolution and Culture. Stephen C. Levinson and Pierre Jaisson (Eds.). (2006, MIT Press.) \$75 (cloth), \$35 (paper), xvii + 296 pages.

This book contains a collection of 13 articles and one rather philosophical preface that were written as the result of the symposium “Evolution and Culture,” organized by the Fyssen Foundation in 1999. The Fyssen foundation is a privately funded French charity that has as its goal the promotion of research into cognitive mechanisms underlying behavior. The evolution of culture is still a hot topic in the study of cognition, as it was then, and this book contains contributions from a number of well-known researchers in the field. Although the book does not contain any articles on computer models, it is nevertheless relevant for researchers working in artificial life, because it contains a lot of ideas, data, and references, and because many of the topics that are addressed lend themselves to computer modeling. Some of the book’s content is speculative and does not necessarily reflect the consensus in the field, however, and it should therefore also be approached with the necessary caution by readers who are new to the field.

The book contains articles that all address some aspect of the evolution of culture, written from the different perspectives of the authors. It consists of two parts, “Emergence of Culture in Evolution” and “Brain, Cognition and Evolution,” each consisting of six chapters. The book also has a preface and an introduction, written by Pierre Jaisson and Stephen Levinson (the editors), respectively, that each count as scientific articles in their own right. Although the book is divided into two parts, the thematic difference between them is not great. The articles in the first part address the question of the evolution of culture from a more historical point of view, while those in the second part perhaps choose a more neurological or behavioral point of view.

The preface and the introduction are both more general chapters spending some effort on explaining why the evolution of culture is worthy of investigation. Jaisson then goes on to argue for the importance of family structure as a precursor of society and culture. Levinson presents a number of factors—such as the ability to read others’ intentions, cultural variation, cultural conservatism, and group selection—that lead to a culture in which knowledge gets accumulated, so that the culture can become increasingly complex. He illustrates this with examples from the Rossel Island culture, a Melanesian culture he has studied.

The next six contributions, forming the “Emergence of Culture in Evolution” part, are by Claude Combes, Robert Foley, Christopher Boehm, Robert Boyd and Peter Richerson, Daniel Dennett, and Dan Sperber. These contributions range from relatively straightforward presentations of data (e.g., the chapter by Foley) to speculative and philosophical (e.g., the chapters by Combes and Dennett). Combes’ chapter is about the importance of symbiosis in what he calls “quantum leaps in evolution.” The implication is that culture is such a quantum leap caused by symbiosis, but this is not elaborated. Dennett discusses whether cultural change can be considered evolution, if in fact the cultural changes (mutations) are not purely arbitrary, but filtered by the interpretation of the people making up the culture. He argues that this is the same as biological evolution, just on a different level. Dennett refers to Sperber, who has published different views on this matter. Sperber’s contribution to the book is on other matters, however. He makes a proposal, based on what he calls “cultural cognitive causal chains,” of a mechanism that would provide the social sciences with a basis that is more comparable to that of

* Universiteit van Amsterdam, Institute of Phonetic Sciences, Spuistraat 210, 1012 VT Amsterdam, The Netherlands. E-mail: b.de.boer@ai.rug.nl

** Artificial Intelligence, Rijksuniversiteit Groningen.

the natural sciences. These chains are the cultural counterpart of individual cognitive causal chains, and Sperber proposes them as building blocks for a natural-science-like theory of the evolution of culture. Whether this is a useful proposal remains to be seen, but Sperber makes an attempt to illustrate his ideas by applying them to aspects of the Dorzé culture of Ethiopia.

Boehm's chapter also occupies the middle ground between philosophical ideas and concrete data. He presents a scenario for the possible evolution of cooperation as we find it in humans, based on observations of our primate relatives and of modern hunter-gatherer cultures. He observes that humans have something that he calls "positive social reinforcement," which actively rewards members of a population who conform to the culture. He presents a scenario going from negative reinforcement (punishment of defectors, and kin-directed altruism, such as is found in the great apes) to a stage with morality and equality (forced by individuals who team up to collectively beat individuals who are stronger). According to Boehm, this stage makes group selection possible, which then would select for the kind of positive social reinforcement we find in humans.

Boyd and Richerson's chapter has a different take on the same topic, the evolution of cooperation. They present five different hypotheses for how cooperation could have evolved in humans and argue that two of these hypotheses likely contribute to explaining the evolution of culture. They are the moralistic reciprocity hypothesis (humans' cognitive abilities allow them to keep track of networks of reciprocity, thus allowing large-scale cooperation) and the cultural group selection hypothesis (groups that cooperate amongst themselves have the advantage over groups that do not). They present some data from Papua New Guinean cultures to support these hypotheses.

Foley's chapter is about the interpretation of the evidence from the fossil record. He argues that the history of human culture is more complex and more gradual than was sometimes previously assumed. His interpretation of the evidence is that there was no biological leap that gave us culture, but that human culture is the result of a long process that was driven by ecological and demographic factors.

The second part of the book focuses on neurological and behavioral aspects of the evolution of culture. It contains contributions by Robin Dunbar, Wolf Singer, Michael Tomasello, Marc Hauser, Randy Gallistel with Rochel Gelman and Sara Cordes, and David Premack and Marc Hauser. Again, some chapters are more speculative than others. The first chapter, by Dunbar, extends his observations about the relation between group size and neocortex size to the observation that apes have a relatively smaller visual cortex than monkeys. He argues that this is because there is only so much need of more visual processing when brains get bigger, while the eyes remain the same size. He continues on a more speculative track that this freed up neocortex for social processing and theory of mind, which could be used for detecting free riders. This in turn allowed evolution of more complex social organization. Singer's chapter is similar to Dunbar's in that here, too, a neurological theory about *Homo sapiens'* unique ability for culture is presented. Singer also argues that theory of mind was crucial for culture and that the emergence of areas in the brain that process output from, and generate input to, older areas of the brain was necessary for this to develop. He presents experimental data to show that synchronicity in the firing of neurons is necessary for keeping track of the complex representations needed for a theory of mind.

Tomasello also argues for the importance of a theory of mind, and he contends that a single adaptation was responsible for the emergence of the modern human ability for culture. He does not speculate about a possible neurological cause, but instead stresses the importance of cultural development after the biological event. He discusses the concept of ratchet culture: culture that becomes gradually more complex because its users understand the intentions behind the things they do. He goes on to argue that humans are unique in this respect.

The chapter by Gallistel and colleagues is the odd one out in this section. They argue that real numbers, and not integers are primary in the human (and animal) ability to count. Although mathematics is often used as an example of a culturally developing human skill, this chapter does not make the link to culture, or to its evolution.

The chapter by Hauser and the chapter by Hauser and Premack are concerned with the comparison of modern human abilities with those of other animals, most notably apes. Hauser investigates morality, and presents a number of animal experiments that have tried to investigate

whether animals are moral, in the sense that they would endure suffering in order to alleviate suffering in others. He argues that the ability to inhibit behavior is important: Inhibition of selfish emotions is necessary to be altruistic. He shows experimental evidence that animals can do this in certain circumstances, but finds it is impossible to draw firm conclusions because of the perennial philosophical question of whether the animals really are altruistic or just have instincts that make them appear altruistic.

In the final chapter, Premack and Hauser argue that animals do not have culture. They state that in order to investigate the evolution of human culture, one needs to define what is typical of human culture. Culture, in their view, is not just socially inherited behavior, but must be part of the definition of identity of the user of that culture. As such behavior has not been attested in animals, they argue that animals do not have culture.

If this seems like a rather bewildering list of topics and points of view, that is exactly what the book contains, and this can at the same time be considered both a strong and a weak point—strong because there are few places where so many articles by so many important researchers in the field are collected in one volume, and weak because the book does not represent a coherent introduction to the field, but rather, a reflection of the state of the art, and of the open questions as seen by a number of different researchers. This problematic point is exacerbated by the fact that the symposium was held in 1999, and many of the articles were written in 2000–2001. When the book appeared last year, the highly dynamic field of the evolution of culture had already moved on beyond the state of the art presented in the book [1–3]. This is illustrated by the insistence by some of the authors that evolution of culture is in fact worth investigating. This was perhaps still questioned in 1999, but in 2006, it was widely accepted as worthwhile (see, e.g., the articles in the journal *Evolution and Human Behavior*).

Another problem is that some of the articles in the book present theories by the authors that are not as universally accepted as might be gleaned from the authors' self-confidence. Especially in the investigation of the neural bases of (social) cognition, but also in the fields of human evolution and animal cognition, much is still debated and scientific consensus is still far off. The authors of the chapters in the book have themselves also written a number of accessible, and more extensive, publications (among others, [1–3]).

Nevertheless, the articles in the book present a worthwhile introduction into the investigation of the evolution of culture. After all, even though most of the chapters reflect personal points of view, they are written by experts in the field, and contain numerous valuable references to work underlying these theories. The book could therefore well serve as a starting point for the exploration of the evolution of culture.

What then is the relevance of this book for researchers in the area of artificial life? As is abundantly clear from the book, evolution of culture involves complex dynamics and interactions on many levels: those of genes, neurons, individuals, and populations. As is also quite clear from the book, this quickly leads to speculation and rather different theories about the same phenomenon. Here lies an opportunity for the computer modeler to operationalize these theories and investigate whether they really explain what they pretend to explain. This is also an opportunity for artificial life researchers to extend their research outside the realm of purely artificial, highly abstract systems to a field of investigation that has the attention of biologists, psychologists, linguists, philosophers, paleontologists, and neurologists, among many others.

References

1. Richerson, P. J., & Boyd, R. (2004). *Not by genes alone: How culture transformed human evolution*. Chicago: University of Chicago Press.
2. Sperber, D., & Hirschfield, L. A. (2004). The cognitive foundations of cultural stability and diversity. *Trends in Cognitive Sciences*, 8(1), 40–46.
3. Tomasello, M. (2003). *Constructing a language*. Cambridge, MA: Harvard University Press.

