

WHY AREN'T THE SOCIAL SCIENCES DARWINIAN? (Introduction to a special issue of the *Journal of Evolutionary Psychology*)

ALEX MESOUDI^{1,*}, DJUKE VELDHUIS, ROBERT A. FOLEY²

¹Queen Mary University of London

²University of Cambridge

Abstract. At the inception of the social sciences in the late 19th century, early psychologists, anthropologists, archaeologists and sociologists frequently proposed evolutionary explanations for social phenomena. Yet by the mid-20th century Darwin's theory had virtually disappeared from the social sciences, and most social scientists continue to reject evolutionary approaches within their disciplines. This special issue of the *Journal of Evolutionary Psychology* contains six papers each of which addresses the question of why social scientists rejected evolution, and why they still do. Three broad reasons are identified by our contributors. First, many social scientists past and present hold distorted views of evolution leading to, in our view, an unfounded rejection of evolutionary theory. This distortion might be addressed by improved education and communication of evolutionary theory. Second, many past applications of evolutionary theory to social phenomena have been inadequate for explaining the kinds of phenomena that social scientists are most interested in, such as rapid cultural change and the emergence of large-scale cooperative institutions. This situation is changing as modern Darwinian approaches incorporate behavioural flexibility, group-level explanations and culture. Finally, certain strands of the social sciences have rejected the scientific method in general, instead adopting non-scientific perspectives such as social constructionism. While this is a broader epistemological issue, the application of evolutionary methods to social phenomena may provide the best and most direct support for the value of the scientific method.

Keywords: evolution, Darwin, social sciences, evolutionary psychology, cultural evolution

* Corresponding author: ALEX MESOUDI, Biological and Experimental Psychology Group, School of Biological and Chemical Sciences, Queen Mary University of London, Mile End Road, London E1 4NS, United Kingdom; Phone: (+44) 020 7882 7486, E-mail: a.mesoudi@qmul.ac.uk

1. INTRODUCTION

Why aren't the social sciences Darwinian? This was the question posed to the participants of a symposium held in 2009 at the Leverhulme Centre for Human Evolutionary Studies, University of Cambridge. This special issue of the *Journal of Evolutionary Psychology* contains papers by six of those participants. Each of the papers addresses the question from a different disciplinary perspective, encompassing anthropology (Perry and Mace; Layton; Tehrani), psychology (Dunbar), sociology (Layton; Hodgson), economics (Hodgson) and archaeology (Riede). In this introduction we provide a broad overview of the arguments put forth in their papers. We also address some underlying assumptions that the contributors took for granted, such as why we (and they) think the social sciences should be Darwinian, and what exactly we mean by the term "Darwinian". We end with suggestions for how the social and biological sciences may be reconciled in the future.

Common to all of the contributions is an impressively detailed history of the impact of evolutionary approaches in different branches of the social sciences, by which we mean socio-cultural anthropology, archaeology, psychology, history, sociology, economics, and any other discipline that concerns itself with human behaviour, cognition, society and culture. This historical understanding is crucial, as any explanation of why the social sciences are not currently Darwinian must recognize how such a situation arose in the first place. Although each social science has a unique history, a general pattern emerges: the social sciences have not always rejected evolutionary theory. When both the social and the biological sciences first appeared in the form that we now recognise them, in the latter part of the 19th century, there was little conceptual divide between them. Evolutionary ideas were frequently applied to human behaviour and human society without much opposition or controversy by anthropologists such as Edward Burnett Tylor and Lewis Henry Morgan (see Perry and Mace and Tehrani), economists such as Thorstein Veblen (see Hodgson), sociologists such as Emile Durkheim and Gabriel Tarde (see Layton), psychologists such as James Baldwin (see Dunbar) and archaeologists such as Hans Hildebrandt (see Riede).

Yet, for various reasons outlined below and in the individual papers, each branch of the social sciences was to eventually reject evolutionary theory, and by the mid-20th century there was a clear parting of ways between the two domains. This situation has not changed much. Few contemporary social scientists would probably describe themselves as Darwinian, or admit to adopting an evolutionary approach to their subject. Indeed, most would probably object to such a label, and to such an approach. Evidence for this supposition is provided in Perry and Mace's paper in this issue. Their survey of the attitudes of students and staff at UK universities towards evolutionary approaches to human behaviour revealed that respondents who identified themselves as social scientists were significantly more likely to reject the relevance of evolution to human behaviour than respondents from non-social science backgrounds. This echoes similar survey findings from 20 years ago

(LIEBERMAN 1989). The question we asked of our contributors was why the social sciences continue to reject Darwinian evolutionary approaches.

2. WHY SHOULD THE SOCIAL SCIENCES BE DARWINIAN?

We should be explicit at this point that we and the contributors, as well as most regular readers of the *Journal of Evolutionary Psychology*, are probably all of the opinion that much work within the social sciences would benefit from a Darwinian perspective. By “Darwinian” we mean the set of assumptions, methods, tools and theories that evolutionary biologists use to explain the diversity and complexity of life on earth. Although evolutionary theory has changed much since Darwin wrote *The Origin* (1859), the fundamental principles of his theory remain the same: (i) a set of entities vary in their characteristics; (ii) not all of these entities are equally likely to survive and reproduce, and whether they do depends at least in part on the characteristics that they possess; and (iii) characteristics are inherited from one generation to the next, such that those characteristics that increase an entity's chances of surviving and reproducing will increase in frequency over time. These three principles constitute what Darwin called “natural selection”, and it is this deceptively simple process that can explain the wonderfully complex and diverse range of living organisms on the planet. Complex organs with numerous inter-connected parts, such as eyes or bacterial flagella, can be explained in terms of the gradual selection of random modifications over time, each of which on average increases an organism's fitness. Diversity emerges as different species adapt to different environments which favour different characteristics, such as the diversification of beak size and shape amongst the finches of the Galapagos Islands as each population gradually adapted to the different ecological conditions of each island. Change over time, diversity, and adaptation are all the inevitable outcomes of Darwinian processes, and clearly also characterise the human species.

Humans, like every other species on the planet, evolved. And human brains, like every other organ in the human body, evolved. So it is not unreasonable to assume that human cognition and behaviour should show evidence of having been shaped by selection in past environments to maximise survival and reproduction. This should not be taken to imply a crude “stone age brain” notion that our behaviour is inflexible and fixed in ways that supposedly enhanced fitness in a Pleistocene “Environment of Evolutionary Adaptedness” (FOLEY 1995; LALAND and BROWN 2002). In fact, the dominant approach to the study of behaviour in biology, behavioural ecology, assumes that behaviour is flexible and broadly adaptive (i.e. maximises genetic fitness) in current environments. Human behavioural ecologists have applied the same principles and the same tools to the study of human behaviour (LALAND and BROWN 2002; WINTERHALDER and SMITH 2000). Such tools include optimality models, which quantitatively predict which behavioural strategies maximize genetic fitness in a given physical or social environment, predictions that

can then be tested in actual human populations using ethnographic data. Optimality models have been used, for example, to explain cross-cultural variation and change in family size (MACE 1998) and mating systems (BORGERHOFF MULDER 1990). The “polygyny threshold” model, for example, predicts that women can maximise their reproductive output by marrying a man who can provide her with the most resources, which depends on the man’s wealth and the number of wives he already has. Data from Kipsigis women in Kenya support these predictions, showing that women are behaving adaptively in their marriage choices (BORGERHOFF MULDER 1990).

Evolutionary psychologists tend to focus on cognition rather than behaviour, looking at how selection has shaped our cognitive architecture to solve recurrent adaptive problems (BARRETT, DUNBAR and LYCETT 2002; SCHALLER, SIMPSON and KENRICK 2006). The assumption that people act to maximise their inclusive genetic fitness has yielded significant insights into several areas of psychological research. These include aggression, such as the finding that homicide is more likely to occur between genetically unrelated people (DALY and WILSON 1988), and interpersonal attraction, such as the finding that women, during periods of their menstrual cycle when they are more likely to conceive, prefer more masculine faces that are indicative of high genetic quality (PENTON-VOAK et al. 1999). Findings such as these are not mere post-hoc redescriptions of existing social science observations; they represent novel findings that were uniquely predicted by evolutionary theory.

Comparative psychologists, meanwhile, have improved our understanding of the human species by studying analogous traits in other species. This can tell us how a trait evolved, which in turn may tell us something about its current function. Comparative studies of non-human behaviour have yielded significant insights into the evolutionary origins and potential functions of intelligence (BYRNE AND WHITEN 1988; DUNBAR 2003), intentionality (TOMASELLO et al. 2005), culture (WHITEN et al. 1999), language (FITCH 2000) and cooperation (JENSEN, CALL and TOMASELLO 2007). Comparative analyses of brain size across primate species, for example, have shown that human intelligence likely evolved primarily to deal with complex social problems such as negotiating relationships and forming coalitions (BYRNE and WHITEN 1988; DUNBAR 1998), a finding that has implications for contemporary human behaviour (e.g. MESOUDI, WHITEN and DUNBAR 2006).

And Darwinian theory is not restricted to genes and genetic evolution. It has increasingly been applied to cultural change. This follows from the observation, made by Darwin himself, that the “entities” in the description of Darwinian evolution given above do not have to be genes, they can be cultural traits such as beliefs, ideas or institutions, all of which are inherited socially rather than genetically. Cultural change therefore constitutes a Darwinian evolutionary process that acts in parallel to genetic evolution, with human behaviour and society the product of both genetic and cultural evolution (MESOUDI, WHITEN and LALAND 2004; RICHERSON and BOYD 2005). Viewing human culture as a Darwinian process allows researchers to use various evolutionary methods to explain cultural change in rigorous, quanti-

tative terms. For example, patterns of popular cultural change, from pop music to first names, have been shown to change according to random drift models with no intrinsic differences between different variants (BENTLEY, HAHN and SHENNAN 2004; MESOUDI and LYCETT 2009). The diffusion of technological innovations documented by sociologists are consistent with conformist cultural transmission, where people preferentially adopt popular traits (HENRICH 2001). Quantitative models adapted from population ecology have been used to explain patterns of historical change, such as the rise and fall of empires (TURCHIN 2003). Dynamic evolutionary models have provided a significantly better understanding of rapid economic change than neo-classical, non-evolutionary models that focus on static equilibria (NELSON and WINTER 1982). Other cultural evolution researchers have used phylogenetic methods, originally developed by biologists to reconstruct the evolutionary history of species, to reconstruct the cultural evolutionary history of behavioural practices such as cattle-keeping and patriliney (HOLDEN and MACE 2003), archaeological artifacts such as projectile points (O'BRIEN, DARWENT and LYMAN 2001) and pottery (SHENNAN and WILKINSON 2001), and languages (PAGEL 2009). Whereas traditional cross-cultural comparisons in anthropology are vulnerable to "Galton's problem", i.e. that societies that share a common ancestor cannot be considered to be independent data points, these phylogenetic methods explicitly control for this problem (MACE and PAGEL 1994) – indeed, they use the problem itself to make new discoveries and observations about historical processes.

This is just a small selection of the novel and significant findings generated by Darwinian methods with regard to social science phenomena (see also DUNBAR and BARRETT 2007; LALAND and BROWN 2002; MESOUDI, WHITEN and LALAND 2006). Despite these novel findings, however, the social sciences continue to reject Darwinian methods and explanations, as demonstrated by Perry and Mace's survey. So why does this resistance exist? The contributors offer several specific possibilities, which we have grouped into three broad categories: (i) confusion in the social sciences concerning exactly how evolutionary theory works and its potential implications and uses; (ii) various inadequacies with the ways in which Darwinian theory has been applied to social science phenomena in the past; and (iii) a broader rejection of the scientific method in the social sciences beyond a rejection of evolutionary theory specifically.

3. REASONS FOR REJECTION

3.1. Confusion over evolutionary theory in the social sciences

The contributors point to several distortions and misunderstandings of evolutionary theory that have been or are still held by many social scientists, and which in their view have resulted in the unfounded rejection of Darwinian approaches in the social sciences. First, both Perry and Mace, and Hodgson, point out that evolution fell

from favour in the social sciences in the mid-20th century in large part due to its association with Social Darwinism and eugenics, which assumed that certain traits such as criminality or mental disability are genetically fixed and should be removed from the population through forced sterilisation and selective breeding. As Perry and Mace point out, Social Darwinism and eugenics are distortions of both Darwin's own theory and the contemporary application of evolutionary methods to humans. Assumptions such as that criminal behaviour is 100% (or indeed largely) genetically inherited and uninfluenced by social conditions have no basis in fact. Indeed, trying to draw any strong political or social implications from evolutionary theory (whether accurate or inaccurate) would be a case of committing the naturalistic fallacy.

Second, and related to cultural evolution, the contributions by Perry and Mace, Layton, Tehrani and Riede all discuss theories of progressive social evolutionism that were popular in the late 19th century. These theories proposed that societies progress through linear and fixed stages of increasing complexity, such as from savagery to barbarism to civilization. As well as the racist connotations of these theories, in which contemporary hunter-gatherer societies are seen as "less evolved" versions of Western societies, Tehrani describes how anthropologists of the diffusionist school (e.g. BOAS 1940; KROEBER 1948) rejected social evolutionism on the justifiable scientific grounds that traits may diffuse across cultural boundaries, a fact that is inconsistent with the social evolutionist assumption that societies independently progress along fixed stages. However, as the contributors point out, social evolutionism bears little resemblance to Darwinian cultural evolution, which does not assume fixed and inevitable progress along a series of stages. Diffusion across cultural boundaries is perfectly compatible with a Darwinian approach, as Tehrani shows in his example of Iranian weaving traditions.

Third, Riede notes that early applications of evolutionary theory to archaeological change were typological, i.e. artifacts were viewed as distinct types and change occurs when one type transforms into another type (much as societies transform from one stage to another in the social evolutionism schemes). This typological notion of evolution is, again, diametrically opposed to Darwinian evolution, which concerns the variation between individual organisms or artifacts *within* a population, and how selection and other processes alter this variation gradually over time (what MAYR [1982] calls "population thinking").

Finally, Dunbar discusses the confusion over what evolutionary explanations are intended to explain. Many social scientists are concerned with proximate explanations. Ethnographers and psychologists, for example, seek to understand the proximate reasons as to why people act in the way that they do, and appeal to motivations, intentions and cognitive processes to explain this. Evolutionary social scientists, on the other hand, are frequently concerned not only with proximate mechanisms but also with ultimate (or functional) explanations for behaviour, i.e. why a particular behaviour has been favoured by evolution (either genetic or cultural). The two levels are not in opposition: a proximate explanation does not (necessarily)

conflict with an ultimate explanation, and vice versa. For example, DALY and WILSON (1988) provided an ultimate explanation for the observation that step-children are more likely to be the victims of infanticide than children raised by their genetic parents in terms of kin selection theory (i.e. genes that direct altruism towards genetic kin will increase the probability of those kin surviving and so help to spread kin-directed altruistic genes). This does not imply, at a proximate level, that parents and step-parents are consciously calculating the inclusive fitness consequences of different levels of care-giving towards individuals of differing relatedness. Explanations are needed at all levels in order to fully explain behaviour. Much of the resistance to evolutionary explanations in the social sciences comes from a failure to recognize that ultimate explanations are not intended to replace existing proximate explanations, merely supplement them.

Unfortunately, many social scientists continue to associate evolutionary theory with the out-dated and empirically untenable past versions of evolutionary theory described above, such as Social Darwinism or social evolutionism. This is supported by Perry and Mace's survey finding that rejection of evolution by social scientists is significantly and negatively correlated with knowledge of evolution. We reiterate that contemporary applications of evolutionary methods and theories to human behaviour bear little or no resemblance to these earlier, distorted versions of Darwin's theory, and we suggest that much of the current rejection of evolutionary theory by social scientists is largely unfounded.

3.2. Evolutionary explanations of social phenomena are often inadequate

The rejection of evolution by social scientists cannot be entirely attributed to confusion amongst social scientists themselves over what evolution is. In many cases the flaws lie with many relatively recent applications of evolutionary theory to human behaviour, such that social scientists might be rather justified in rejecting the resulting explanations.

Dunbar points out that the social sciences parted company from the biological sciences at a time when evolution was still quite poorly understood. Indeed, until very recently evolutionary theory has been incapable of explaining many of the phenomena that social scientists are interested in, such as the formation and structure of social groups. As Dunbar notes, it was not until HAMILTON's (1964) inclusive fitness theory that unworkable group selection theories were purged from biology. This moved the focus of behavioural ecology to the individual and, ultimately, the gene, and while such approaches were more accurate than naïve group selection explanations, they still failed to incorporate groups into evolutionary analyses. Layton makes a similar argument, that whereas Emile Durkheim is often accused by evolutionary social scientists of promulgating a "blank slate" view of the mind (e.g. PINKER 2002) and consequently divorcing the social sciences from evolutionary theory, in fact evolutionary theory has not, until recently, been capable of explain-

ing many of the social phenomena that Durkheim and other sociologists were (and still are) interested in, such as social structures and collective group-level phenomena.

Hodgson argues that phenomena such as rapid changes in technology and the emergence of large-scale cooperative institutions can be explained only by extending the concept of evolution to cultural change. This is reinforced by Tehrani's and Riede's papers which both concern cultural change. The tendency for some evolutionary psychologists to discount or downplay the influence of culture (e.g. TOOBY and COSMIDES 1992) may have quite justifiably led to the continued rejection of evolutionary theory by social scientists, many of whom take culture as their main focus of study.

Finally, Riede notes that a flaw in early applications of evolutionary theory in archaeology is the automatic assumption that selection is responsible for a particular trend or pattern before ruling out alternative explanations. A similar adaptationist critique can be made of much past and contemporary research across the human evolutionary social sciences more broadly (LALAND and BROWN 2002), i.e. that an explanation for a particular pattern of behaviour is proposed in terms of some specific past selection pressure without explicitly or robustly testing this assumption against alternative selection hypotheses, or whether it is the product of non-selective processes such as drift or exaptation.

Recently, however, these flaws have begun to be addressed. In the last decade or so evolutionary biologists and evolutionary social scientists have renewed their interest in groups and group-level phenomena in the form of multi-level selection (OKASHA 2006) and cultural (rather than genetic) group selection (HENRICH 2004). Layton also points to recent co-evolutionary analyses of social processes, as well as niche construction and complex systems theory, as further means of explaining social phenomena. Cultural evolution researchers have explicitly incorporated cultural change into a broader evolutionary framework, showing that traits that were once heralded as universal and genetically-evolved may be subject to substantial cultural influence, such as cooperation (HENRICH et al. 2005) and mating behaviour (MESOUDI and LALAND 2007). Recent cultural evolution research has also begun to correct the adaptationist error noted by Riede by explicitly testing the distribution of cultural traits against predictions expected under drift before invoking an explanation in terms of selection, just as is done in biology (e.g. BENTLEY, HAHN and SHENNAN 2004; MESOUDI and LYCETT 2009). These recent trends give us hope that the biological and social sciences may be increasingly converging in their subject matter.

3.3. Evolution, or science in general?

A final reason for the biological/social science divide raised by our contributors (Perry and Mace; Dunbar) is the rejection by some social scientists of the scientific method more broadly. The rise within the social sciences and humanities in recent

decades of perspectives variously labelled social constructivism, post-modernism, hermeneutics and reflexivity have encouraged the rejection not only of evolutionary approaches to the study of humans, but of *any* kind of scientific explanation (see SLINGERLAND [2008] for a comprehensive overview and critique of these approaches). According to these perspectives, science is viewed as a socially constructed system of knowledge that is no more valid than other non-scientific ways of understanding the world. This is clearly a larger issue than the acceptance or rejection of evolutionary theory. But we note that this cannot explain the rejection of evolution across all of the social sciences, given that several social science disciplines are fully scientific and quantitative, such as economics, psychology and much of sociology. Indeed, Perry and Mace's survey indicates that training in psychology is significantly correlated with acceptance of evolution, in contrast to other social sciences.

4. CONCLUSIONS

We have outlined three broad obstacles to the acceptance of Darwinian evolutionary theory in the social sciences. First, there is still much confusion in the social sciences over exactly how evolution works and its implications. Many social scientists continue to associate evolution with out-dated and untenable notions of Social Darwinism or social evolutionism, such that their rejection of contemporary evolutionary explanations of human behaviour are, we suggest, unfounded. This might be corrected by improved education at university level, including the teaching of basic evolutionary theory as part of social science programmes, and better communication by evolutionary social scientists of their research. Unfortunately, as Perry and Mace point out, many social scientists appear to acquire biased and distorted beliefs concerning evolution during their training, as evidenced by their survey finding that rejection of evolution is significantly correlated with the number of years spent studying the social sciences.

Second, many past applications of Darwinian theory to human behaviour have failed to address key phenomena that social scientists are interested in, such as groups and culture, such that social scientists' rejection of such applications has been rather justified. Yet recent developments in evolutionary biology and the evolutionary social sciences explicitly addresses these shortcomings, and fully incorporates behavioural flexibility, group-level phenomena and cultural influences. As the evolutionary social sciences become increasingly synthesized (SEAR, LAWSON and DICKINS 2007) we anticipate Darwinian approaches to social phenomena further widening in scope and increasing in rigour, as, for example, evolutionary psychologists incorporate cultural evolution into their analyses and vice versa.

The third reason for the rejection of evolutionary theory in the social sciences is a general lack of acceptance of the scientific method amongst certain social scientists. This is a larger issue than the acceptance or rejection of evolutionary theory in

particular, and reflects a broader epistemological debate. However, we note that since the biological sciences became fully integrated within a Darwinian evolutionary framework in the 1940s, biology has been enormously successful in explaining the diversity and complexity of life on earth. The social sciences, which at around the same time rejected evolutionary theory, have been rather less successful in the ensuing decades. Different branches of the social sciences remain theoretically and epistemologically fractionated, with little exchange of theories and findings. We suggest that Darwinian evolutionary theory can provide a similar conceptual framework for the social sciences as it did the biological sciences (GINTIS 2007; MESOUDI, WHITEN and LALAND 2006), a framework in which social phenomena are the joint product of genetic and cultural evolution and rigorous, quantitative evolutionary methods are used to explain such phenomena.

REFERENCES

- BARRETT, L., DUNBAR, R. I. M. & LYCETT, J. (2002): *Human Evolutionary Psychology*. Basingstoke: Palgrave.
- BENTLEY, R. A., HAHN, M. W. & SHENNAN, S. J. (2004): Random drift and culture change. *Proceedings of the Royal Society B*, 271, 1443–1450.
- BOAS, F. (1940): *Race, Language and Culture*. New York: Macmillan.
- BORGERHOFF MULDER, M. (1990): Kipsigis women's preferences for wealthy men: Evidence for female choice in mammals? *Behavioral Ecology and Sociobiology*, 27, 255–264.
- BYRNE, R. W. & WHITEN, A. (Eds.): (1988): *Machiavellian Intelligence: Social Expertise and the Evolution of Intellect in Monkeys, Apes, and Humans*. Oxford: Clarendon Press.
- DALY, M. & WILSON, M. (1988): *Homicide*. Hawthorne, NY: Aldine de Gruyter.
- DARWIN, C. (1859): *The Origin of Species*. London: Penguin, 1968.
- DUNBAR, R. I. M. (1998): The social brain hypothesis. *Evolutionary Anthropology*, 6, 178–190.
- DUNBAR, R. I. M. (2003): The social brain. *Annual Review of Anthropology*, 32, 163–181.
- DUNBAR, R. I. M. & BARRETT, L. (2007): *Oxford Handbook of Evolutionary Psychology*. Oxford: Oxford University Press.
- FITCH, W. T. (2000): The evolution of speech: A comparative review. *Trends in Cognitive Sciences*, 4, 258–266.
- FOLEY, R. (1995): The adaptive legacy of human evolution: A search for the environment of evolutionary adaptedness. *Evolutionary Anthropology*, 4, 194–203.
- GINTIS, H. (2007): A framework for the unification of the behavioral sciences. *Behavioral and Brain Sciences*, 30, 1–61.
- HAMILTON, W. D. (1964): The genetical evolution of social behaviour I and II. *Journal of Theoretical Biology*, 7, 1–52.
- HENRICH, J. (2001): Cultural transmission and the diffusion of innovations. *American Anthropologist*, 103, 992–1013.
- HENRICH, J. (2004): Cultural group selection, coevolutionary processes and large-scale cooperation. *Journal of Economic Behavior and Organization*, 53, 3–35.
- HENRICH, J., BOYD, R., BOWLES, S., CAMERER, C., FEHR, E., GINTIS, H., et al. (2005): "Economic man" in cross-cultural perspective: Behavioral experiments in 15 small-scale societies. *Behavioral and Brain Sciences*, 28, 795–855.

- HOLDEN, C. J. & MACE, R. (2003): Spread of cattle led to the loss of matrilineal descent in Africa: A coevolutionary analysis. *Proceedings of the Royal Society B*, 270, 2425–2433.
- JENSEN, K., CALL, J. & TOMASELLO, M. (2007): Chimpanzees are rational maximizers in an ultimatum game. *Science*, 318, 107.
- KROEBER, A. L. (1948): *Anthropology*. New York: Harcourt, Brace and Co.
- LALAND, K. N. & BROWN, G. R. (2002): *Sense and Nonsense*. Oxford: Oxford University Press.
- LIEBERMAN, L. (1989): A discipline divided: Acceptance of human sociobiological concepts in anthropology. *Current Anthropology*, 30, 676–682.
- MACE, R. (1998): The coevolution of human fertility and wealth inheritance strategies. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 353, 389.
- MACE, R. & PAGEL, M. D. (1994): The comparative method in anthropology. *Current Anthropology*, 35, 549–564.
- MAYR, E. (1982): *The growth of biological thought*. Cambridge, MA: Harvard University Press.
- MESOUDI, A. & LALAND, K. N. (2007): Culturally transmitted paternity beliefs and the evolution of human mating behaviour. *Proceedings of the Royal Society B*, 274, 1273–1278.
- MESOUDI, A. & LYCETT, S. J. (2009): Random copying, frequency-dependent copying and culture change. *Evolution and Human Behavior*, 30, 41–48.
- MESOUDI, A., WHITEN, A. & DUNBAR, R. I. M. (2006): A bias for social information in human cultural transmission. *British Journal of Psychology*, 97, 405–423.
- MESOUDI, A., WHITEN, A. & LALAND, K. N. (2004): Is human cultural evolution Darwinian? *Evolution*, 58, 1–11.
- MESOUDI, A., WHITEN, A. & LALAND, K. N. (2006): Towards a unified science of cultural evolution. *Behavioral and Brain Sciences*, 29, 329–383.
- NELSON, R. R. & WINTER, S. G. (1982): *An Evolutionary Theory of Economic Change*. Cambridge, MA: Harvard University Press.
- O'BRIEN, M. J., DARWENT, J. & LYMAN, R. L. (2001): Cladistics is useful for reconstructing archaeological phylogenies: Palaeoindian points from the southeastern United States. *Journal of Archaeological Science*, 28, 1115–1136.
- OKASHA, S. (2006): *Evolution and the Levels of Selection*. New York: Oxford University Press.
- PAGEL, M. (2009): Human language as a culturally transmitted replicator. *Nature Reviews Genetics*, 10, 405–415.
- PENTON-VOAK, I. S., PERRETT, D. I., CASTLES, D. L., KOBAYASHI, T., BURT, D. M., MURRAY, L. K., et al. (1999): Menstrual cycle alters face preference. *Nature*, 399, 741–742.
- PINKER, S. (2002): *The Blank Slate*. London: Penguin Books.
- RICHERSON, P. J. & BOYD, R. (2005): *Not by Genes Alone*. Chicago: University of Chicago Press.
- SCHALLER, M., SIMPSON, J. A. & KENRICK, D. T. (2006): *Evolution and Social Psychology*. New York: Psychology Press.
- SEAR, R., LAWSON, D. W. & DICKINS, T. E. (2007): Synthesis in the human evolutionary behavioural sciences. *Journal of Evolutionary Psychology*, 5, 3–28.
- SHENNAN, S. J. & WILKINSON, J. R. (2001): Ceramic style change and neutral evolution: A case study from neolithic Europe. *American Antiquity*, 66, 577–593.
- SLINGERLAND, E. (2008): *What Science Offers the Humanities*. Cambridge: Cambridge University Press.
- TOMASELLO, M., CARPENTER, M., CALL, J., BEHNE, T. & MOLL, H. (2005): Understanding and sharing intentions: The origins of cultural cognition. *Behavioral and Brain Sciences*, 28, 675–691.
- TOOBY, J. & COSMIDES, L. (1992): The psychological foundations of culture. In: J. H. Barkow, L. Cosmides & J. Tooby (eds.) *The Adapted Mind*. London: Oxford University Press, pp. 19–136.

- TURCHIN, P. (2003): *Historical Dynamics: Why States Rise and Fall*. Princeton, NJ: Princeton University Press.
- WHITEN, A., GOODALL, J., MCGREW, W. C., NISHIDA, T., REYNOLDS, V., SUGIYAMA, Y., et al. (1999): Cultures in chimpanzees. *Nature*, 399, 682–685.
- WINTERHALDER, B. & SMITH, E. A. (2000): Analyzing adaptive strategies: Human behavioral ecology at twenty-five. *Evolutionary Anthropology*, 9, 51–72.