

Human Evolution Beyond Biology and Culture

Evolutionary Social, Environmental and Policy Sciences

Both natural and cultural selection played an important role in shaping human evolution. Since cultural change can itself be regarded as evolutionary, a process of gene–culture coevolution operates. The study of human evolution – in the past, present and future – is therefore not restricted to biology. An inclusive comprehension of human evolution relies on integrating insights about cultural, economic and technological evolution with relevant elements of evolutionary biology. In addition, proximate causes and effects of cultures need to be added to the picture – issues which are at the forefront of social sciences such as anthropology, economics, geography and innovation studies.

This book highlights discussions on the many topics to which such generalised evolutionary thought has been applied: the arts, the brain, climate change, cooking, criminality, environmental problems, futurism, gender issues, group processes, humour, industrial dynamics, institutions, languages, medicine, music, psychology, public policy, religion, sex, sociality and sports.

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and Policy Sciences

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Preface

In the summer of 2015, my family and I visited Charles Darwin's *Down House* in the UK. While zigzagging along narrow roads through dense forests, our beloved car navigation system provided guidance. Since it had occasionally misled us in the past, we decided to double-check whether we were going in the right direction. As our station wagon crawled past the van of a young gardener, we called through the open window: 'Down House', followed by 'Darwin'. Although he gave the impression of being a local, neither name seemed to ring any bells. Indeed, occasionally one can bump into Earthlings who are unaware of Darwin and the great intellectual leap he made. A Darwinian evolutionary explanation of life represents one of the most counterintuitive results of science. That's why, more than 150 years after Darwin's magnum opus *On the Origin of Species* (...) appeared, many still refuse to accept it. Others have gone far beyond acceptance, offering evolutionary accounts of numerous phenomena outside the realm of biology. This had already begun in Darwin's time and, more recently, has advanced considerably, with the aim of better understanding all sorts of complex non-living processes and systems.

Many take for granted that the evolutionary history of humans has, like that of animals, completely been determined by genetic evolution. But there is increasing evidence that, once culture emerged in human groups, a combination of natural and cultural selection started to shape the course of human evolution. Culture as information obtained from other individuals through social transmission processes has given rise to cumulative social learning beyond generations. It has affected the evolution of human physiology, brain–mind and behaviour, for at least the last 100 000 years. This worked through cultural traits, such as cooperation with non-kin, sharing of food, exchange of products, labour division, technological innovation, religion and even cooking. In other words, the old and widespread idea that genetic evolution caused culture in a unidirectional way is erroneous. Given that cultural change takes the form of an evolutionary process, as defended in this book, a genuine process of gene–culture coevolution operates, meaning that genetic and cultural evolution exerted mutual influences. The study of human evolution – in the past, present and future – is therefore not the sole domain of biology. A comprehensive picture of human evolution relies on successfully integrating insights about cultural evolution with relevant elements of human evolutionary biology. To this, we need to add information about proximate causes and effects of cultures as studied in social sciences, such as anthropology, economics, geography and innovation studies. These two tasks characterise what this book sets out to do.

Its approach is consistent with the modern belief that the main difference between humans and the most intelligent other primates is not overall multipurpose intelligence, but the unique human ability for social learning and precise imitation. Culture is the ultimate expression of this ability, and has made humans in cultural groups immensely more intelligent than they would be if they had, hypothetically, lived a solitary life – in which case, they would have lacked frequent feedback and advice from experienced individuals since birth. Humans would then not possess cultural knowledge, tools, language, books, science and education. In fact, if one could erase social learning and hence culture from human history, the intellectual ability of humans would probably not exceed that of chimpanzees by much. Given that this is a far cry from reality, the study of human evolution requires a broader scientific approach as sketched.

Another theme guiding this book is that evolution is everywhere, what has been occasionally called ‘universal Darwinism’, ‘generalised evolution’ or an ‘extended synthesis’. While a broad range of topics to which evolutionary thinking has been applied will receive attention, the treatment includes a strong emphasis on social science issues and public policy challenges. Evolutionary concepts are inextricably woven into the fields of sociology, anthropology, organisation studies, political science, economics, technological innovation studies and environmental sciences. Some of these can even be said to have a genuine ‘evolutionary branch’, as is definitely true for anthropology and economics. Admittedly, the term ‘evolution’ is not consistently used in all studies. Authors sometimes speak instead of multi-agent or agent-based modelling, population theories, heterogeneous agents or even complexity theory. In many cases, though, these reflect a foundation in evolutionary principles. My motivation for writing this book is that a comprehensive account of evolutionary thought in the social, environmental and policy sciences is utterly missing. By filling this gap, I hope to contribute to transdisciplinary exchange and learning, among the social sciences, as well as with the natural sciences. In addition, I intend to reach the well-educated reader who is interested in how genetic and non-genetic evolution affect culture, technology, the economy, the environment and climate, and even politics and policies.

The notion of ‘generalised evolution’, which characterises the book’s approach, emphasises that a similar evolutionary framework is employed in distinct study areas. One might call this the V-S-I-R approach, referring to the combination of four basic components and processes, namely variation, selection, innovation and replication. Without submitting to ‘biology envy’, proponents of evolutionary approaches in a wider domain can unquestionably learn a great deal from biology, given its 150-year history of evolutionary reasoning. It is undeniable that evolutionary biology is far ahead of the crowd in exploring evolutionary concepts, models and experiments. Therefore, this book will devote attention to transferring concepts and insights from biology to the social sciences – and to some extent also vice versa. Social scientists can learn from debates in biology, such as regarding the levels of selection, the role of groups versus individuals, or the importance of modular evolution. This does not mean that one has to rely solely on biological metaphors in expanding the reach of evolutionary thinking. It should be reassuring to know that mathematics has already come up with generalised metaphors, namely in the form of evolutionary models and algorithms. These are

frequently used nowadays, not only in biology but also in economics, innovation studies, operations research, computer science, robotics and artificial intelligence.

It would be an understatement to claim that evolutionary thinking in the social sciences is not accepted by everyone. Averting and defensive responses take the form of evolutionary social studies not being required, not being relevant, or being politically incorrect. No offence, but such rejection often takes the form of knocking down a straw man. Indeed, one frequently encounters a lack of understanding of basic evolutionary principles, let alone of advanced notions, among social scientists rejecting evolutionary social science thinking. Regrettably, many evolutionary biologists who dislike notions of social or cultural evolution don't do much better. Their motivations frequently witness a misapprehension of non-genetic evolution and how it differs from, as well as resembles, genetic evolution. A growing number of researchers, though, seem to accept the usefulness of evolutionary thinking to the social sciences. This book will, in various places, most systematically in Section 1.4, address the concerns of the sceptics and critics of evolutionary social science approaches. It will clarify that genetic and non-genetic evolution share many similarities – justifying the term evolution – while they also differ in important ways. Non-genetic evolution is neither an extrapolation nor a simple analogy of biological evolution. Specific differences depend on whether we are talking about cultural, economic, technological or other types of non-genetic evolution. Furthermore, the two can be interactive, ranging from reinforcing to opposing each other's tendencies and outcomes, as is central to theories of dual inheritance or gene–culture coevolution. As we will see, such extended evolutionary thinking can provide surprising insights about many aspects of the modern world, including music, sports, economic development, cooking, language, medicine, criminal law, the role of sex and gender in society, religions and even humour.

I expect this book to offer stimulating ideas to different readers. Biologists may be intrigued by the details of evolutionary studies in the social sciences. Social scientists can learn from advanced theories in evolutionary biology, as well as about evolutionary thinking in social science disciplines other than their own. Unlike many other treatises, I attempt to give a balanced and fair account of ideas and theories, allowing space for pro- and contra-arguments and, when useful, adding a personal judgement. Those motivated by topical issues will be happy to find practical evolutionary outlooks on environmental problems, climate change and, more generally, the design of public policies. The book is, moreover, aimed at reaching laypersons and experts alike. Readers do not require much background as concise accounts of generalised evolutionary thinking and evolutionary biology are offered, including non-technical treatments of advanced topics. Moreover, while the book is scholarly in depth and scope, I have tried to write in accessible language. To further improve readability, a 'box format' is used throughout with the objective of separating illustrative and advanced themes from the main text.

Since my late teens, I have been intrigued by anything associated with evolutionary reasoning. It struck me as surprising and meaningful, and I felt everyone should know about it. Its focus on ultimate causes was effective in removing the mystery around many fundamental questions about origins. I miss such an approach in the social

sciences, which was one motivation to write this book. Some three decades ago, I started reading seriously into evolutionary social sciences and wrote about them for the first time almost 20 years ago. Given that I conducted research on a variety of themes in environmental economics and innovation studies, and worked regularly on projects with biologists, it was almost inevitable that evolutionary thinking and modelling would enter my academic research. I have learnt a great deal from my former PhD students while working on evolutionary and related themes in environmental science, behavioural economics and innovation economics, notably Joelle Noailly, Karolina Safarzynska, Julian Garcia, Volker Nannen, Paolo Zeppini, Elisabeth Gsottbauer, Juliana Subtil Lacerda and Ardjan Gazheli. I further had the luck to collaborate in evolution-oriented studies with resourceful colleagues: Gusztai Eiben, Albert Faber, Koen Frenken, John Gowdy, Annemarth Idenburg, Giorgos Kallis, Frans Oosterhuis, Christian Rammel, Sigrid Stagl and Cees Withagen. In addition, this book has profited from my teaching of evolutionary economics in Amsterdam, Barcelona and Vienna, as well as at the Max Planck Institute of Economics in Jena, Germany. The latter hosted a unique evolutionary economics unit directed by Ulrich Witt, from whom I have always received great intellectual and moral support. I am very grateful to other colleagues for spending the time and intellectual energy to comment on particular chapters or parts thereof: Jan Boersema, Jeffrey Funk, Frank Geels, John Gowdy, Fjalar de Haan, Rutger Hoekstra, Javier Martínez-Picado, Sergio Rossi, Karolina Safarzynska, Victor Sarto Monteys and David Stern. I am especially indebted to Nico van Straalen for very detailed comments on Chapters 3 and 4, to Karl Frost for critical feedback on Chapter 7, and to Eric Galbraith for closely reading Chapters 11 and 16. In addition, Matthew Kelly and Tessa Dunlop provided excellent language suggestions, while Miklós Antal helped me raise the resolution of two figures. I am grateful to the team of Cambridge University Press for such proficient support during the various stages of the production process: Dominic Lewis, Aleksandra Serocka, Jenny van der Meijden and Judith Shaw. Others inadvertently influenced my thinking about evolution. My son, Django, at times pointed me to internet videos or television documentaries featuring unusual organisms – one of his fascinations. A number of these creatures have made it into this book. From him and my daughter, Gaia, I learned that evolution can be fascinating to youngsters. My wife, Rosa, served as an unmerited sounding board and insistently encouraged me to finish the manuscript. Without her, I would probably still be halfway.

Some material previously appeared in another form. Chapter 6 is a revised and extended version of an article in *Journal of Economic Behavior and Organization* (2009), 72(1), pp. 1–20. Section 8.5 contains revised and extended text parts from my chapter on ‘Evolutionary modelling’ in J. Proops and P. Safonov (eds), 2004, *Modelling in Ecological Economics*, Edward Elgar, Cheltenham. Some material in Sections 13.2 to 13.4 is adapted and revised from an article in *Journal of Evolutionary Economics* (2007), 17(5), pp. 521–549, and text parts in Sections 14.3 and 14.5 from an article in *Technological Forecasting and Social Change* (2013), 80(1), pp. 11–23. Chapter 15 is a revised and extended version of an article that appeared in *Journal of Bioeconomics* (2013), 15(3), pp. 281–303. Permission was granted by the associated publishers, Edward Elgar Publishing, Elsevier and Springer.

In the spirit of evolutionary thought, I want to end with two disclaimers. My personal flaws – of a physiological (bad eyesight), intellectual (selective reading) and social (sporadic hermit-like behaviour) nature – serve as a proximate explanation for any mistake the reader may find in this book. The ultimate explanation is, of course, that natural selection is imperfect, having failed to wipe out such flaws in my ancestors. So, in all earnestness, at the end of the day evolution is to be blamed for all remaining errors.