Evolution and Rationality

This volume explores from multiple perspectives the subtle and interesting relationship between the theory of rational choice and Darwinian evolution. In rational choice theory, agents are assumed to make choices that maximize their utility; in evolution, natural selection ‘chooses’ between phenotypes according to the criterion of fitness maximization. So there is a parallel between utility in rational choice theory, and fitness in Darwinian theory. This conceptual link between fitness and utility is mirrored by the interesting parallels between formal models of evolution and rational choice. The essays in this volume, by leading philosophers, economists, biologists and psychologists, explore the connection between evolution and rational choice in a number of different contexts, including choice under uncertainty, strategic decision making and prosocial behaviour. They will be of interest to students and researchers in philosophy of science, evolutionary biology, economics and psychology.

Samir Okasha is Professor of Philosophy of Science at the University of Bristol. He is the author of Philosophy of Science: A Very Short Introduction (2002) and Evolution and the Levels of Selection (2006).

Ken Binmore is Professor Emeritus of Economics at University College, London, and a Visiting Emeritus Professor of Economics at the University of Bristol. He is the author of Natural Justice (2005), Game Theory: A Very Short Introduction (2007), and Rational Decisions (2008).
EVOLUTION AND RATIONALITY

Decisions, Co-operation and Strategic Behaviour

EDITED BY

SAMIR OKASHA AND KEN BINMORE
## Contents

<table>
<thead>
<tr>
<th>List of figures and tables</th>
<th>page vii</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of contributors</td>
<td>ix</td>
</tr>
</tbody>
</table>

### Introduction

**Samir Okasha and Ken Binmore**

1 Towards a Darwinian theory of decision making: games and the biological roots of behavior

*Peter Hammerstein*

2 What do humans maximize?

*Claire El Mouden, Maxwell Burton-Chellew, Andy Gardner, and Stuart A. West*

3 Natural selection and rational decisions

*Alasdair I. Houston*

4 Evolution, dynamics and rationality: the limits of ESS methodology

*Simon M. Huttegger and Kevin J. S. Zollman*

5 Are rational actor models “rational” outside small worlds?

*Henry Brighton and Gerd Gigerenzer*

6 Pull, push or both? Indirect evolution in economics and beyond

*Siegfried Berninghaus, Werner Güth and Hartmut Kliemt*

7 Schelling formalized: strategic choices of non-rational behaviour

*David H. Wolpert and Julian Jamison*

8 Human cooperation and reciprocity

*Jack Vromen*
Contents

9 Team reasoning, framing and cooperation 185
   Natalie Gold

10 An evolutionary perspective on the unification of the behavioral sciences 213
   Herbert Gintis

11 From fitness to utility 246
   Kim Sterelny

Index 274
Figures and Tables

FIGURES

2.1 Inclusive fitness is the sum of an individual’s direct and indirect fitness  \( \text{page } 24 \)
2.2 Evolutionary explanations for cooperation  \( 28 \)
4.1 A prisoner’s dilemma  \( 69 \)
4.2 The chain-store game  \( 73 \)
4.3 The Sir Philip Sidney game  \( 76 \)
5.1 Possible combinations of the three basic forms of discrepancy, stochasticity, underspecification, and misspecification  \( 88 \)
5.2 Nonstationarity as a form of misspecification  \( 90 \)
5.3 Can ignoring information be beneficial?  \( 101 \)
6.1 Simple trust interaction with \( b > 1 > 0 > a \)  \( 114 \)
6.2 Trust with private type information  \( 116 \)
6.3 Population dynamics with imperfect type information  \( 119 \)
6.4 Cycling of type compositions in \((p, q)\)-space  \( 123 \)
8.1 Superior fitness as eventual outcome: the causal chain of functionality  \( 163 \)
8.2 Superior fitness as ultimate desire: an inferential reasoning scheme  \( 164 \)
8.3 The outrage-reduction hypothesis  \( 172 \)
8.4 The moral indignation–spite hypothesis  \( 174 \)
9.1 The prisoner’s dilemma  \( 187 \)
9.2 A stag hunt  \( 188 \)
10.1 Alice and Bob try to coordinate  \( 235 \)
10.2 Alice, Bob, and the choreographer  \( 237 \)
Figures and tables

Tables

2.1 A Hamiltonian classification of social behaviours 27
6.1 Player types in simple games of trust 122
6.2 Push and pull combinations at different explanatory levels 125
Contributors

SIEGFRIED BERNINGHAUS is a Professor in the Department of Economics, Karlsruhe Institute of Technology.

HENRY BRIGHTON is a Research Scientist at the Center for Adaptive Behavior and Cognition, Max Planck Institute for Human Development, Berlin.

MAXWELL BURTON-CHELLEW is a Postdoctoral Researcher, Department of Zoology, University of Oxford.

CLAIRE EL MOUDEN is a Postdoctoral Prize Research Fellow at Nuffield College and Research Fellow, Department of Zoology, University of Oxford.

ANDY GARDNER is a Royal Society University Research Fellow, Department of Zoology, University of Oxford.

GERD GIGERENZER is Director of the Center for Adaptive Behavior and Cognition, Max Planck Institute for Human Development, Berlin.

HERBERT GINTIS is Professor of Economics, Central European University, and at the Santa Fe Institute.

NATALIE GOLD is a Senior Research Fellow at King’s College, London.

WERNER GÜTH is Director of the Strategic Interaction Group, Max Planck Institute of Economics, Jena.

PETER HAMMERSTEIN is Professor at the Institute for Theoretical Biology, Humboldt University, Berlin.

ALASDAIR I. HOUSTON is Professor of Theoretical Biology at the University of Bristol.
List of contributors

Simon M. Huttegger is Associate Professor of Philosophy, University of California, Irvine.

Julian Jamison is Senior Economist at the Center for Behavioral Economics, Federal Reserve Bank of Boston.

Hartmut Kliemt is Professor of Philosophy and Economics, Frankfurt School of Finance and Management.

Kim Sterelny is Professor of Philosophy at the Australian National University.

Jack Vromen is Professor of Theoretical Philosophy at Erasmus University, Rotterdam.

Stuart A. West is Professor of Evolutionary Biology, Department of Zoology, University of Oxford.

David H. Wolpert is at the Santa Fe Institute.

Kevin J. S. Zollman is Assistant Professor of Philosophy, Carnegie Mellon University.