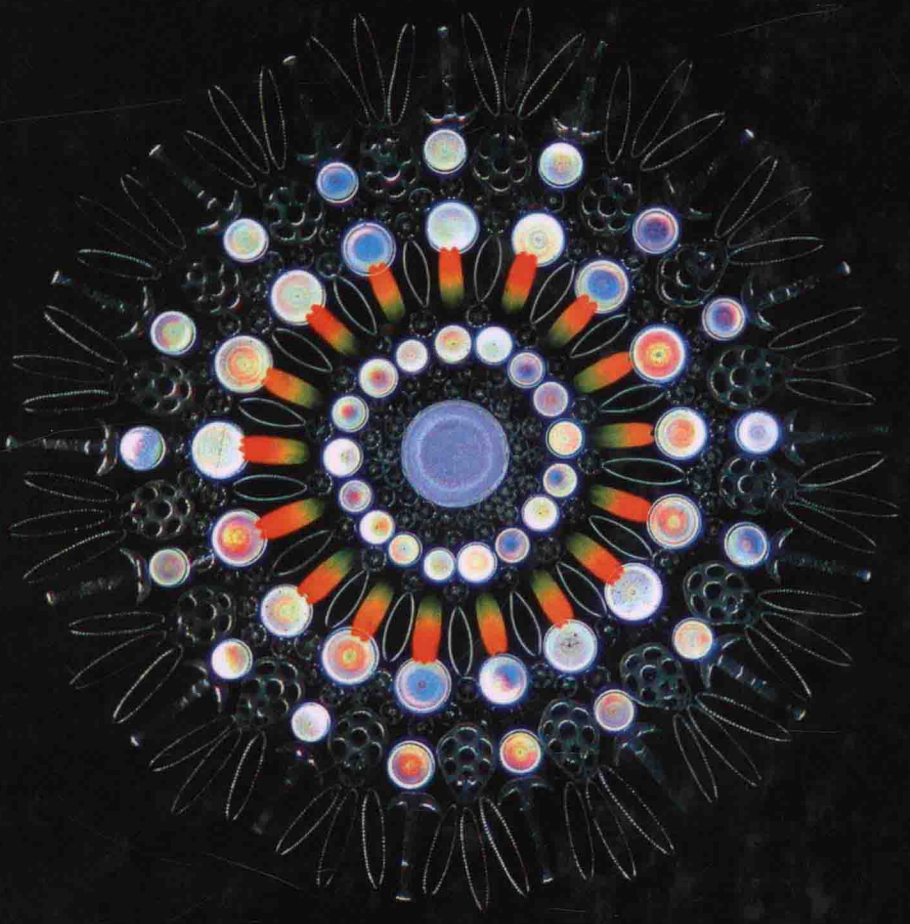
EVOLUTIONARY BIOLOGY

Conceptual, Ethical, and Religious Issues



EDITED BY
R. PAUL THOMPSON AND DENIS M. WALSH

CAMBRIDGE

EVOLUTIONARY BIOLOGY

Conceptual, Ethical, and Religious Issues

EDITED BY

R. PAUL THOMPSON
University of Toronto

and

DENIS WALSH
University of Toronto

CAMBRIDGE
UNIVERSITY PRESS

CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

Published in the United States of America by Cambridge University Press, New York

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781107027015

First published 2014

Printed in the United Kingdom by Clays, St Ives plc

A catalogue record for this publication is available from the British Library

Library of Congress Cataloguing in Publication data
Evolutionary biology : conceptual, ethical, and religious issues / edited by R. Paul Thompson and Denis Walsh.
pages cm
Includes bibliographical references and index.
ISBN 978-1-107-02701-5 (hardback)
1. Biology–Philosophy. 2. Evolution (Biology) I. Thompson, R. Paul, 1947–, editor of compilation.
QH331.E87 2014
576.8–dc23 2013039683

ISBN 978-1-107-02701-5 Hardback

EVOLUTIONARY BIOLOGY

Evolution – both the fact that it occurred and the theory describing the mechanisms by which it occurred – is an intrinsic and central component in modern biology. Theodosius Dobzhansky captures this well in the much-quoted title of his 1973 paper, "Nothing in biology makes sense except in the light of evolution." The correctness of this assertion is even more obvious today: philosophers of biology and biologists agree that the fact of evolution is undeniable, and that the theory of evolution explains that fact. Such a theory has far-reaching implications. In this volume, twelve distinguished scholars address the conceptual, metaphysical, and epistemological richness of the theory and its ethical and religious impact, exploring topics including DNA barcoding, three grand challenges of human evolution, teleology, historicity, design, evolution and development, and religion and secular humanism. The volume will be of great interest to those studying philosophy of biology and evolutionary biology.

R. PAUL THOMPSON is Professor in the Institute for the History and Philosophy of Science and Technology and the Department of Ecology and Evolutionary Biology at the University of Toronto. His most recent books include *The Structure of Biological Theories* (1989) and *Agro-Technology* (Cambridge, 2011), and he is editor of *Issues in Evolutionary Ethics* (1995).

DENIS WALSH holds the Canada Research Chair in the Philosophy of Biology and is a member of the Department of Philosophy, the Institute for the History and Philosophy of Science and Technology, and the Department for Ecology and Evolutionary Biology at the University of Toronto. He is editor of *Naturalism, Evolution and Mind* (Cambridge, 2001).

For Michael Edward Ruse
Intellectual pioneer, a founder of modern philosophy of biology,
dedicated student mentor and a warm supportive friend to many

Contributors

FRANCISCO AYALA is University Professor and Donald Bren Professor in the Department of Ecology and Evolutionary Biology at the University of California, Irvine.

JOHN BEATTY is Professor in the Department of Philosophy at the University of British Columbia.

DAVID CASTLE is Professor at the ESRC Innogen Centre at the University of Edinburgh.

MARC ERESHEFSKY is Professor in the Department of Philosophy at the University of Calgary.

JEAN GAYON is Professor at the Institut d'histoire et de philosophie des sciences et des techniques at the Université Paris 1 Panthéon-Sorbonne.

PHILIP KITCHER is John Dewey Professor of Philosophy at Columbia University.

MANFRED LAUBICHLER is Professor at the Center for Biology and Society, and Center for Social Dynamics and Complexity at Arizona State University.

JANE MAIENSCHEIN is Professor, Regents' Professor, and President's Professor at the Center for Biology and Society and School of Life Sciences at Arizona State University.

ALEX ROSENBERG is Chair and R. Taylor Cole Professor of Philosophy at the Department of Philosophy, Duke University.

ELLIOTT SOBER is Professor, Hans Reichenbach Professor, and William F. Vilas Research Professor at the Department of Philosophy at the University of Wisconsin–Madison.

R. PAUL THOMPSON is Professor at the Institute for the History and Philosophy of Science and Technology, the Department of Ecology and Evolutionary Biology, and the Department of Philosophy, at the University of Toronto.

DENIS WALSH is Professor at the Institute for the History and Philosophy of Science and Technology, Department of Philosophy, and the Department of Ecology and Evolutionary Biology, at the University of Toronto.

Acknowledgments

Evolutionary theory has a complex and fascinating history, and it is conceptually and theoretically rich. Hence, it is not surprising that historians, philosophers, and biologists have mined the rich veins of gold it contains. As this volume demonstrates there is considerable gold left to be unearthed.

There is a worthy tradition of thanking those who, directly or indirectly, have had an impact on a volume. Our list is too extensive to make specific mention practicable. Those that have contributed chapters have, obviously, had a crucial impact on its quality and relevance. Those who provided helpful comments on the proposal and the text have improved the final result. We would like to acknowledge the serious health issues that prevented Elisabeth Lloyd and Robert Brandon from submitting chapters. The staff of Cambridge University Press have made important contributions to the accuracy, readability, and style of the volume: Hilary Gaskin (editor), Emma Walker and Anna Lowe, in particular. Also, many thanks to Sylvia Nickerson for the artwork in Chapter 9, Fermin Fulda for compiling the index, and Alison Evans of Out of House Publishing. Those who know our spouses, Jennifer McShane and Deborah Kohn, are familiar with their constant support and encouragement; for others we acknowledge here their support and endurance. Although having no specific hand in this volume, always lurking in the background is the indefatigable Michael Ruse.

Contents

Introduction

Contemporary analytic philosophy of biology was forged in the 1960s. It began a little more than 50 years ago with Morton Beckner's *The Biological Way of Thought* (1959). Building on this seminal contribution, in articles and books, Thomas Goudge (*The Ascent of Life*, 1961), Marjorie Green (*Approaches to a Philosophical Biology*, 1968), David Hull (*Philosophy of Biological Science*, 1974), and Michael Ruse (*The Philosophy of Biology*, 1973) laid the foundation for modern philosophy of biology.[1] These founders of the field articulated and staked out positions on nearly all the important logical and conceptual underpinnings of evolutionary biology, as well as the social implications of its theories and empirical discoveries.

Michael Ruse's 1973 *Philosophy of Biology* consolidated the field by providing a rigorous analysis and comprehensive treatment of nearly all the critical conceptual issues, including those that have remained contentious; it still stands as a *tour de force*. In 1979, *The Darwinian Revolution: Science Red in Tooth and Claw* was published. It remains an exemplar of the integration of philosophy of science and history of science. Since that time, he has:

- founded, in 1986, the leading journal in philosophy of biology, *Biology and Philosophy* (and nurtured it into being one of the top four journals in philosophy of science);
- founded, in 1995, and edited, from 1995 to 2011, the *Cambridge Studies in Philosophy and Biology* series, which during that period published 80 of the most important books in the field;

[1] A few biologists – J. H. Woodger, C. H. Waddington, and Bernhard Rentch, for example – and physicists – Erwin Schrödinger, for instance – had tackled philosophical aspects of biology but philosophical interest in biology by philosophers of science dates from the work of this group. Earlier philosophical work such as Henri Bergson's *Creative Evolution* and the use by philosophers of Darwinian fitness and Lamarckian inheritance, such as by Herbert Spencer, are very different from contemporary analytic philosophy of biology.

- written more than 20 books (almost all of which have been translated into other languages);
- edited more than a dozen books;
- contributed more than 100 journal articles;
- been a leader in championing evolution in the broader society and in promoting science education.

Moreover, his impact on philosophy of biology includes mentoring several generations of researchers and scholars who have achieved international reputations in their own right. He has received numerous prestigious research awards, including the John Simon Guggenheim Fellowship and Isaak Walton Killam Fellowship. He was elected Fellow of the Royal Society of Canada and Fellow of the American Association for the Advancement of Science, and has received honorary degrees from the University of Bergen, McMaster University, and the University of New Brunswick.

Given his formative role in the development of philosophy of biology, his contributions to research and scholarship, his broader social contributions, his mentoring of generations of scholars and researchers, and his impressive publication record and influence, it is fitting that this volume of original articles by internationally renowned philosophers of biology should be dedicated to him. Although some of the contributors to this volume disagree with some of his positions and arguments, all recognize his importance and the profound impact he has had on the field; many make direct reference to his work. As Michael has told so many of us over the last 50-plus years, "criticize me; just don't ignore me." He has certainly not been ignored and there is no shortage of criticism.

This volume continues the exploration of evolutionary biology that he initiated. Today evolution – both the fact that it occurred and the theory, descended from Darwin, describing the mechanisms by which it occurred – is an intrinsic and central component in modern biology. Theodosius Dobzhansky captures this well in the oft-quoted title of one of his 1973 papers,[2] "Nothing in biology makes sense except in the light of evolution." The correctness of this assertion is even more obvious today than in 1973. Philosophers of biology, historians of biology, and biologists agree that the fact of evolution is undeniable, and that the theory of evolution provides unity to evolutionary biology as a whole, is conceptually rich, and has far-reaching social implications. Like all scientific theories,

[2] Dobzhansky 1973.

however, there are some conceptual and epistemological underpinnings on which there is no settled opinion. Also, like all sciences, there are implications of evolutionary biology that engender intense public controversy.

Notwithstanding the central place of evolutionary theory in biology, there are a number of conceptual and epistemological underpinnings on which there is no settled opinion. These include: the relationship of organisms and their molecular components, the nature of species, the nature of adaptation, the formal (logical/mathematical) structure of evolutionary theory, and the nature and role of development. Each of these poses deep philosophical challenges. The chapters in this volume continue and advance the discussion of them.

The contributors to this volume are philosophers and biologists who have been at the forefront of seeking resolutions to these pivotal conceptual and societal issues. With the exception of the tension between evolution and certain religious sects, there has been considerable convergence, over the last 50 years, with respect to all these issues. Sometimes the convergence has moved debate closer to resolution; sometimes it has led to an identification of remaining impediments. In the case of the tension between evolution and literalist fundamentalist Christianity and Islam, the nature of the tensions and the critical importance of resolving them have been brought into sharper focus. The goal of the volume is to provide readers with a window on the current thinking of those who have shaped the discourse on these contentious issues over several decades.

The collection begins with a contribution from the eminent evolutionary biologist Francisco Ayala. Professor Ayala has a longstanding history of collaboration with Michael Ruse, and his chapter demonstrates the rich potential to be found in the cross-pollination between philosophy and evolutionary biology that Ruse has done so much to foster. Ayala takes up themes broached in Ruse's most recent book, *The Philosophy of Human Evolution* (2012). Specifically, Ayala addresses the evolution of ethical behavior in the transition from ape to human. Ethical behavior has clearly evolved, but quite how it might have done so has been a challenge to evolutionists. There are two principal problems for any evolutionary ethics. The first is that the standard strategy deployed in explaining the evolution of some structure or ability appears to break down in the case of the human capacity for moral judgment and action. Typically, to explain the conditions under which some feature has evolved, one simply articulates the fitness benefit that feature confers on its bearers. The vexed problem for evolutionary ethics is that moral imperatives and fitness imperatives don't obviously coincide. The second problem is what Ayala calls the

"naturalistic fallacy." Those who seek to ground ethical behavior in evolution run the risk of negating it. If ethical behavior consists in acting ultimately on fitness imperatives, then we have merely been duped by our genes into thinking we are acting under the guise of the moral good.

Ayala's chapter seeks to finesse these two problems simultaneously. He distinguishes between two questions that are often conflated: (1) whether our capacity for moral deliberation and behavior is an evolutionary endowment, and (2) whether the specific moral norms that guide our actions are an evolutionary endowment. Ayala delivers a positive verdict on the first question: "Humans evaluate their behavior as either right or wrong, moral or immoral, as a consequence of their eminent intellectual capacities, which include self-awareness and abstract thinking. These intellectual capacities are products of the evolutionary process, but they are distinctively human" (p. 18). But, in opposition to much of sociobiology and mainstream evolutionary ethics, he insists upon a negative answer to the second: "moral norms according to which we evaluate particular actions as morally either good or bad ... are products of cultural evolution, not of biological evolution. The norms of morality belong, in this respect, to the same category of phenomena as the languages spoken by different peoples, their political and religious institutions, and the arts, sciences, and technology" (p. 18).

The capacity for ethical behavior, Ayala argues, is conferred on us by three distinctively human cognitive abilities: the ability to anticipate consequences, the ability to make value judgments, and the ability to choose between available courses of action. While these abilities are jointly constitutive of the capacity for ethical behavior, they are not exclusively moral faculties. They grow out of the facility that our hominin ancestors developed for the use and production of tools, means–end reasoning, the planning and assessment of other forms of action. Ayala sees "no evidence that ethical behavior developed because it was adaptive in itself ... It seems rather that the likely target of natural selection was the development of advanced intellectual capacities" (p. 22).

After Francisco Ayala's tour through the challenges facing the study of human evolution, Part I of this collection turns to an area of dispute in which Michael Ruse has become particularly prominent in recent years: the compatibility of evolutionary biology with religious thought. Ruse has been perhaps the pre-eminent exponent of conciliation between the power of evolutionary biology to reveal the mysteries of life, and the draw many feel toward devotional religious belief. Ruse has consistently valued irenics over histrionics on these matters; his has been the voice of