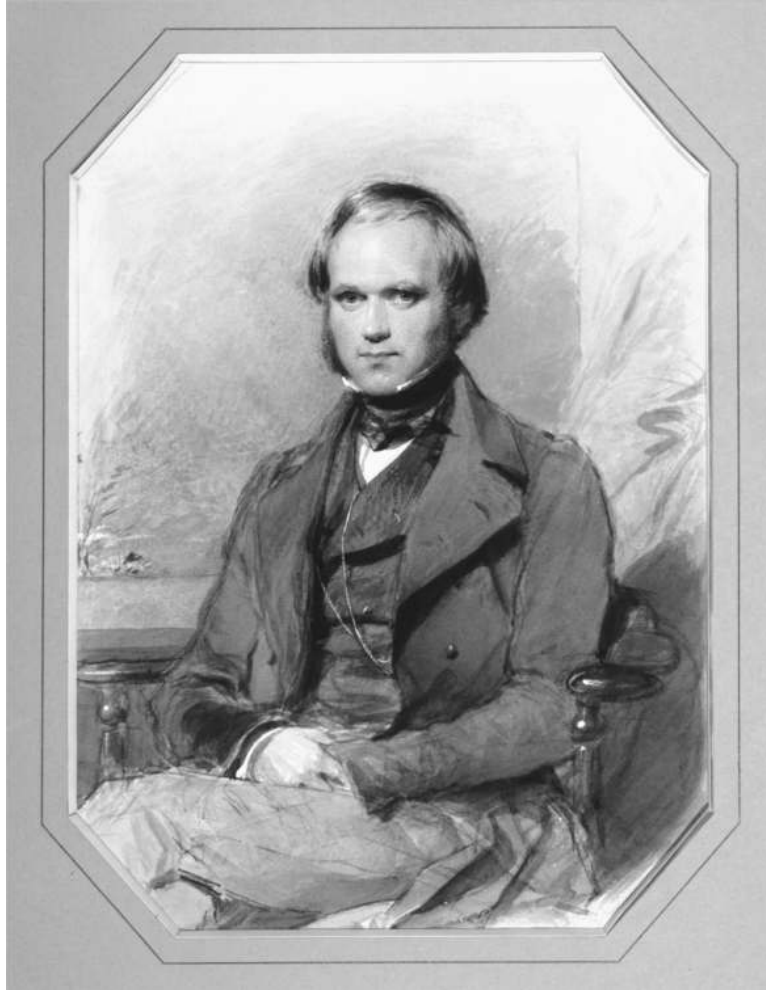


## THE CAMBRIDGE ENCYCLOPEDIA OF DARWIN AND EVOLUTIONARY THOUGHT

This volume is a comprehensive reference work on the life, labors, and influence of the great evolutionist Charles Darwin. With more than sixty essays written by an international group representing the leading scholars in the field, this is the definitive work on Darwin. It covers the background to Darwin's discovery of the theory of evolution through natural selection, the work he produced and his contemporaries' reactions to it, and his influence on science in the 150 years since the publication of *Origin of Species*. It also explores the implications of Darwin's discoveries in religion, politics, gender, literature, culture, philosophy, and medicine, critically evaluating Darwin's legacy. Fully illustrated and clearly written, it is suitable for scholars and students as well as the general reader. The wealth of information it provides about the history of evolutionary thought makes it a crucial resource for understanding the controversies that surround evolution today.

MICHAEL RUSE is Lucyle T. Werkmeister Professor of Philosophy and Director of the Program in the History and Philosophy of Science at Florida State University. He is the author of twenty books and the founding editor of *Biology and Philosophy*.



A portrait of Charles Darwin by the noted watercolorist George Richmond, painted in 1839 in celebration of his marriage to his first cousin Emma Wedgwood. Permission: English Heritage

THE CAMBRIDGE ENCYCLOPEDIA OF  
DARWIN AND  
EVOLUTIONARY THOUGHT



Edited by

**MICHAEL RUSE**

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Cambridge University Press is part of Cambridge University Press & Assessment,  
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Information on this title: [www.cambridge.org/9780521195317](http://www.cambridge.org/9780521195317)

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First published 2013

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

*Library of Congress Cataloging-in-Publication data*

The Cambridge encyclopedia of Darwin and evolutionary thought /  
 [edited by] Michael Ruse.

p. cm.

Includes bibliographical references and index.

ISBN 978-0-521-19531-7 (hardback)

1. Darwin, Charles, 1809–1882 – Encyclopedias. 2. Evolution  
 (Biology) – Encyclopedias. I. Ruse, Michael.

QH360.2.C36 2012

576.8'203–dc23 2012010226

ISBN 978-0-521-19531-7 Hardback

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## Preface

CHARLES ROBERT DARWIN, the fifth child (of six) and second son of Dr. Robert Darwin and his wife Susannah (formerly Wedgwood) of Shrewsbury (pronounced Shrowsberry), a town in the English Midlands next to the Welsh border, was born on 12 February 1809 (the same day as Abraham Lincoln across the Atlantic) (Fig. Preface.1). He was sent to one of England's famous public (in reality private) schools and then at a young age was directed north, to Edinburgh, the capital of Scotland, to study medicine. After two years he realized that medicine was not for him, and so he moved south to Cambridge, to work for a degree and prepare for the life of a clergyman in the Church of England. He graduated in 1831.

Through connections he had made as a student, Darwin was offered the chance to join the British warship HMS *Beagle*, as it set off for South America to map the coastline (Plate I). The voyage took five years, eventually going all the way around the world, returning to England in 1836. By this time, all thoughts of a clerical life had vanished, and Darwin, supported by family money, settled into full-time work as a scientist. He became an evolutionist shortly after the *Beagle* voyage and discovered the mechanism for which he is famous, natural selection, in 1838. He married his first cousin Emma Wedgwood early in 1839 (Fig. Preface.2), and by that time, starting to show the signs of a still-unknown illness that plagued him for the rest of his life, he settled into the role of a somewhat reclusive invalid. The couple moved to a house in Kent and in all had ten children, seven of whom lived to maturity.

Darwin did not publish for twenty years, and then did so only because a young naturalist, Alfred Russel Wallace, sent him an essay containing virtually the same ideas that he had discovered in the late 1830s. Rapidly Darwin wrote up his theory, and *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life* appeared late in 1859 (Plate II). The work caused great controversy and was attacked by many, including leading churchmen (notably Samuel Wilberforce, bishop of Oxford), and defended by many others, including leading scientists (notably Thomas Henry Huxley, morphologist, paleontologist, college teacher and administrator, and general man of letters). Twelve years after *Origin*, in 1871, Darwin followed with a work on our own species, *The Descent of Man and Selection in Relation to Sex*. He died at home, his heart exhausted, in April

## PREFACE



**FIGURE PREFACE.1.** Charles Darwin at about age six with his younger sister at about age four. From H. E. Litchfield, *Emma Darwin, Wife of Charles Darwin: A Century of Family Letters* (Cambridge: privately printed by Cambridge University Press, 1904)



**FIGURE PREFACE.2.** An etching of the partner picture of Emma Wedgwood, by George Richmond, painted to mark her marriage to Charles Darwin. From H. E. Litchfield, *Emma Darwin, Wife of Charles Darwin: A Century of Family Letters* (Cambridge: privately printed by Cambridge University Press, 1904)

1882. By general acclaim he was buried in Westminster Abby, where he lies today, next to the great Isaac Newton.

Darwin is famous. Darwin is controversial. In England to this day his memory is cherished, and his name honored. His face, nearly covered by his full beard, is on the back of the ten-pound note, a successor to that other great Victorian, Charles Dickens. Elsewhere also the name of Darwin is held in high esteem. Yet in many parts of America, and increasingly in other areas of the world, he is taken to be the apotheosis of all that is wrong with modern society: parents and teachers, church leaders and politicians, do all that they can to exclude him from the classroom. The Darwinian Revolution ranks up there in the history of science with the Copernican Revolution. No one today doubts that the Earth goes around the sun. Many today doubt that we humans are modified monkeys.

This is an encyclopedia about Darwin and his influence, written by a team of experts, drawn from the ranks of practicing scientists as well as from those on the side of the humanities. We are united in the conviction that Charles Darwin and his work were and are very important – in science and in many other fields of human activity and inquiry, including philosophy, theology, linguistics, and literature. If we do not infect you with our enthusiasm and leave you sharing our conviction, we have failed in our task. What we are not trying to do is convince you that Darwin was always right. He was not. Nor, conversely, are we trying to show you that Darwin

was basically wrong. He was not. And we are certainly not trying to show that, right or wrong, overall Darwin's influence is either malicious or overrated. This is not true, although we agree fully that things are far more complex than simple good or ill. Finally, thank goodness, we are not trying to show that everything is known and that everyone agrees. You will see in these pages that often we differ among ourselves about some very important points. This is a good part of what makes it all so exciting. Charles Darwin was one of the towering figures in Western civilization, and his legacy is with us still today. We want to share with you our knowledge and our thrill at great ideas. Some monkeys! Some modification!

The volume is intended to be entire unto itself, but you might want to flesh out your reading by turning to some original sources. The *Origin of Species* is a remarkably readable book for a classic. All references in this volume, unless it is explicitly stated otherwise, are to the first edition, and this is the one that you should read. (You can tell if you have the first edition because the work does not contain the alternative name for natural selection, “survival of the fittest,” added to some of the later editions.) There is a facsimile (paperback) edition, with a short introduction by the eminent, twentieth-century evolutionist Ernst Mayr, published by Harvard University Press. All of Darwin's published material is now online (*The Complete Work of Charles Darwin Online*, <http://darwin-online.org.uk/>).

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PREFACE

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Thanks to immense labors by John van Wyhe, it is a wonderful resource with much supplementary material, including reviews and the like. It includes the invaluable bibliography *Darwin: A Reader's Guide*, by Michael T. Ghiselin.

For almost three decades now a dedicated team of researchers has been producing the definitive edition of Darwin's voluminous correspondence. In this *Encyclopedia*, published letters are referred to by volume and page, and also identify the sender and recipient. Thus: Darwin 1985-, 14:423, letter to M. E. Boole, 14 December 1866. There is much work still to be done. It is possible to access online almost all of the letters thus far edited, with synopses of

letters yet to be edited and published. Consult the "Darwin Correspondence Project," <http://www.darwinproject.ac.uk/>. Unpublished letters, part of the Correspondence Project, are referred to by catalog number: DCP, 9105, letter to G. H. Darwin, 21 October [1873]. The notebooks in which Darwin worked out his ideas about evolution were transcribed, edited, and published in 1987 by a team headed by Paul Barrett. References are to this edition, with name and page of the particular notebook. Thus: Barrett et al. 1987, D2. Unpublished manuscripts in the Darwin Archives at the University Library, Cambridge, are referenced by catalog number. Thus: CUL DAR 210.8: 42.

## Acknowledgments

“I am rather sorry that you are Editor, as I have always heard that an Editor’s life is one of ceaseless trouble & anxiety.” Sharing with Jane Austen and Michael Ruse a lifelong inability to master the spelling of the English language, this is from a letter written by Charles Darwin, on 24 December 1866, to Benjamin Dann Walsh, an American-residing entomologist who had been at Cambridge at the same time as Darwin and who was the associate editor of the *Practical Entomologist*. Forget the orthography and focus on the sentiment. Never were truer words said! Walsh had no illusions. After the failure of the *Practical Entomologist*, he took up the editorship of the *American Entomologist*. On 29 August 1868, quoting Proverbs, he wrote to Darwin: “I have recently returned like a dog to his vomit, & again become Editor of a Monthly Periodical (of which I enclose a Prospectus) devoted to Economic Entomology.”

So one asks oneself why one takes time and effort to edit a volume such as this. The most obvious reason does not apply. There can be no pretense that this volume is designed to introduce readers to a new and growing field. To use a metaphor, Darwin Studies is a field very well plowed indeed. But that in a way gives us the reason. It became clear after 2009, the year of many conferences and publications celebrating the 200th anniversary of the birth of Charles Darwin and the 150th anniversary of the publication of his great book, *On the Origin of Species*, that there was huge interest in his ideas and their consequences. Much work was ongoing and many new and interesting facts were coming to light and equally new and interesting interpretations being offered. It was the genius of my editor at Cambridge University Press, Beatrice Rehl, to see that this was so and that there was now need of a volume that gathered all together in one place to give people a full sense of scholarship today on Darwin and his importance. This was a need obviously intensified by the fact that Darwin’s work is still highly controversial in the United States and increasingly elsewhere and that how we think about the topic has immediate consequences for education and much more.

I agreed with her, and after some hesitation – hesitation that would have been much greater had I realized the work involved – I committed myself to editing such a volume. So let me start by thanking all of my contributors (and some who in the

## ACKNOWLEDGMENTS

end did not join the collection) for sharing with me my enthusiasm for such a project and for putting up with my constant prodding and pushing. Ultimately this volume stands or falls by the essays that they have written. I should say that it has been very gratifying to have many very senior people join in the project when the last thing they needed was one more invitation to write a piece for a collection. It has been no less gratifying to find younger people working on all aspects of Darwin and his influence, and to them also I extend my thanks for taking this project so seriously. And it must be said that I am very much in the debt of my scientist authors who saw that we all have much to gain when scholars from different sides of the campus come together to share in understanding the work of a great man and his ever-widening influence of so many aspects of life today. One of the real joys of a job such as this is bringing into the public light work that you have long thought terrific, albeit regrettably unknown. Let me embarrass William Kimler by saying that I was determined to have his wonderful work on mimicry in this volume, and now I do.

Contributors are vital. So also is the editor. Such a volume as this cannot be just a collection of pieces, however good. The editor has to have an underlying and unifying vision. That sounds a little pretentious, but it is true. My vision starts with the fact that ultimately and fundamentally Charles Darwin was a scientist – not a theologian, not a philosopher, not a literary critic, whatever his influence in those fields. This is the thread, the backbone, of this book, and if you do not see this, then I have failed myself and I have failed you. On this linking theme I have tried to build, to add and extend, in many different directions – those connected to the areas just mentioned like religion, philosophy, literature, as well as to other fields like politics, ecology (both in the more technical scientific sense and in the more popular value-laden sense), feminist theory, and more. I wanted also to show that although Darwin may have been the quintessential Englishman, his influence spread out across the world, changing and yet being changed by the cultures into which it entered. I am particularly pleased that I was able to conclude the volume with an essay on one of the newest areas of evolutionary thinking, its application to medicine. I am very grateful to one of today's most eminent scientist-physicians for having agreed to coauthor this piece.

My thinking about Darwin and his importance was formed by and has persisted from a year (1972–73) that I spent at Cambridge University attached to the Department of History and Philosophy of Science. I like to joke that I rarely agree with the opinions of the Marxist scholar Robert M. Young, and he never agrees with mine, but I still think that his was the most original mind that turned to the study of Darwin. His influence was reinforced by contact with the great historian of geology Martin Rudwick, as well as by Roy Porter, then the equivalent of a postdoctoral student, and the future historian of medicine William Bynum. Across in the University Library, in charge of the Darwin Archives, was the ever-knowledgeable and helpful Peter Gautrey. Always available and willing to talk and share ideas was Sydney Smith of St. Catharine's College, who concealed a keen intellect and immense background

understanding behind the facade of being the archetypal, old English buffer.

In the four decades since that tremendous year I have come to know many scientists who worked and continue to work in the tradition of Darwin. Above all, my life has been enriched by my friendship with the great student of social behavior, Edward O. Wilson of Harvard University. If I had not already made the joke about Bob Young, I would make the same joke about Ed Wilson. There isn't much we agree on, in science or in philosophy. But we are bound by deep feelings of friendship and on my side by the realization that it is the science of men such as he that enrich our understanding of Darwin himself and of his great influence and importance. The same can be said of the many other evolutionists that I have read and met and argued with through the years: these include Ernst Mayr, George C. Williams, John Maynard Smith, William D. Hamilton, Nicholas Davies, Steven Jay Gould, John J. Sepkoski, Francisco J. Ayala, Richard Dawkins, and Randolph Nesse. Deduce who would be most likely to be doing mathematics while having flasks of home-made beer behind him fermenting on the windowsill. Then check your answer.

Throughout my career I enjoyed the friendship and support and advice of my fellow philosopher and historian of science, the late David Hull. I miss his presence every day and my greatest regret is that he was unable to contribute to this volume. He knew about this project and thought I was crazy to do it. Very much alive and contributors are my fellow-born Englishman Jonathan Hodge, whose incredible generosity to all scholars is deservedly legendary; Robert J. Richards, who has convinced me of the great importance to our story of the polymath Herbert Spencer, something of which Bob approves heartily and I do not; Jean Gayon, whose piece was way over-length but so interesting and ground breaking that I broke all of my rules and divided it into two so I had an excuse to use all of it; and Ronald L. Numbers, whose mistaken obsession with American college football is more than balanced by tremendous sensitivity to the history of the relationship between science and religion, especially since the coming of evolutionary thinking. More immediately, during those dark nights that afflict any editor, I have turned for support and advice to Bob Richards, Joe Cain, Greg Radick, David Sepkoski, Jane Maienschein, John Beatty, and many times to my colleague Fritz Davis.

Beatrice Rehl has been my friend and supporter and backbone through this whole task. She has been aided by her assistants and more recently by my production editor Brian MacDonald and indexer Lin Maria Riotto. Martin Young, my illustrator, worked and reworked the material I gave to him. Eric Rogers, my research assistant, found sources and contacts that neither he nor I dreamed really existed. Mary Tudor complained that when she died they would find "Calais" (the last British possession in France) engraved on her heart. They will find the word "Permissions" on mine. As always my family was there for support. Words cannot tell of my love for my wife Lizzie, who always knows when I need criticism and

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ACKNOWLEDGMENTS

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when, emphatically, I do not. This debt should not be taken as an excuse to get yet another dog. Finally, I am very much obliged to my home institution, Florida State University, not just for giving me the time and support to do such a job as this, but for financial aid through the Werkmeister funds

attached to my professorship and through other sources from the Program in the History and Philosophy of Science and the College of Arts and Sciences. I am proud that my former dean and present friend Joe Travis agreed to contribute to this encyclopedia.