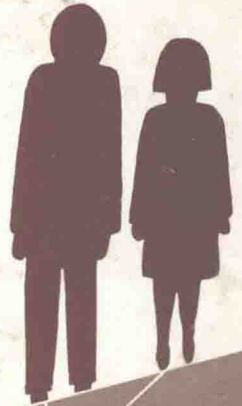


# EVOLUTION FOR NATURALISTS

The Simple Principles and  
Complex Reality

Philip J. Darlington, Jr.



# EVOLUTION FOR NATURALISTS: The Simple Principles and Complex Reality

**P. J. Darlington, Jr.**

Museum of Comparative Zoology  
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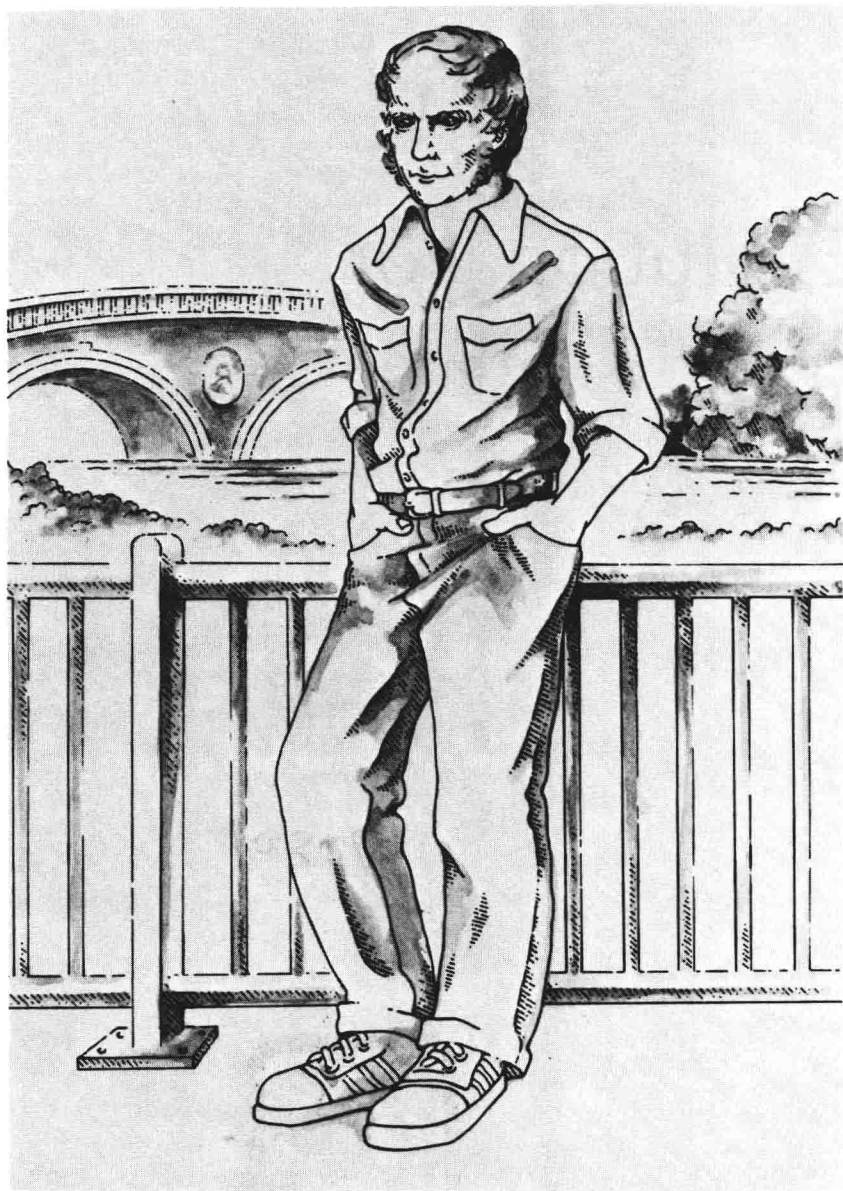
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# Evolution For Naturalists



How Charles Darwin might have looked as a modern graduate student just back from five years of field work. This picture is intended to fix in readers' minds that Darwin was at his most innovative at this age, and readers should remember that Darwin might now be denied admission to a good graduate school because of his deficiencies in languages and math.

**To Ernst Mayr  
in friendship and admiration**

## **PREFACE**

### **ABOUT THE BOOK**

This book is about organic evolution—the evolution of life on earth. It is intended as a reasonably complete, readable description and assessment of the theory of evolution as it stands now.

I want to describe organic evolution in plain words rather than mathematically, relate it to other processes of directional change in ways that will (I hope) promote understanding of it, and at the same time reassess current theories of it so critically as to have some chance of correcting old errors and discovering new things about it. Both professional biologists and naturalists should find something of interest in a book like this, and I have tried to write it in terms intelligible to both. The book might therefore be used as a starting point for reorientation or self-education in evolution by persons whose minds are not closed on the subject. It is not designed as a text, but might be used as the core of a somewhat unconventional, open-ended course or seminar rather than a conventional package.

Biologists should begin the book with Chapter 1, but naturalists may do better to begin with Chapter 9, which traces our own evolutionary history from the beginning, and then turn back to Chapter 1.

To write for both professional biologists and nonprofessional naturalists is not easy. Dawkins, in *The Selfish Gene*, says, "I have assumed that the layman has no special knowledge, but I have not assumed that he is stupid. . . . I have worked hard to try to [present] subtle and complicated ideas in non-mathematical language, without losing their essence." This is what I have tried to do, and I have assumed also that serious naturalists will work—read and think—to understand evolution. They must, if they wish to make intelligent decisions about themselves and their environment. Several of my chapters are somewhat technical, because they have to be, but naturalists should be able to get the essential points without

reading every word. The role that I ask good naturalists to play in the study of evolution, and in application of evolutionary principles to people and problems, is outlined in the summary of Chapter 10. I ask a lot!

What is a naturalist? One definition is: a person who sees nature.<sup>7</sup> Good naturalists not only see and take pleasure in individual plants and animals but also see communities and environments. And serious naturalists try to understand what they see, which means (among other things) understanding evolution. Naturalists *walk*; no other way of getting around lets them see as much. And most naturalists are self-taught.

Darwin was a naturalist who saw the plants and animals around him (and collected beetles), and who was self-taught. I do not think he ever had a formal course in biology, although he sometimes attended lectures. And he learned from friends; he was "the man who walked with Henslow," a botanist friend. His informal autobiography, written for his family, is fascinating reading for naturalists now. The edition to read is the uncensored one, edited by his granddaughter Nora Barlow (London, Collins, 1958; New York, Norton, 1969).

Professional biologists often take an organism out of its environment or model parts of evolutionary processes without seeing wholes. By doing this they learn things that could not be learned in any other way, but they too often fail to see reality as naturalists do. Good, serious naturalists should not defer to professional biologists. The reality that naturalists see is at least as important as the parts that professionals see. Naturalists and professionals can both profit by exchanging views, with mutual respect.

This book cannot be documented like a research paper. The reading and reference lists at the end of each chapter are like naturalists' walks through a forest. Naturalists cannot look everywhere at once, but usually focus on special things—on trees, or fungi, or birds, or insects—with the option of turning aside to anything exciting they find unexpectedly. Call it planned walking with serendipity. And even within a special focus naturalists can see only a small part of what is in the whole forest, and what they see and talk about depends partly on chance, on what they happen to find. My reading and reference lists are a naturalist's walks through a forest of literature. They focus on special aspects of evolution, with the option of turning aside to anything I have found exciting; and the books and articles listed and talked about (in parenthetical comments) depend partly on chance, on what I have happened to find. This is the only kind of reading and reference list that can be fitted into a book like this, and it may be the best kind for naturalists and sometimes for biologists too. (The lists are described in more detail in Chapter 3.)

I shall, here, look at evolution from three points of view. The first is that of a naturalist concerned with what we see, or ought to see, around us.



The second is that of a professional academic biologist, awed by recent spectacular advances in the understanding of life at all levels from molecules to the biosphere as a whole, and wanting to keep up to date without losing a realistic sense of proportion. And the third is that of a human being, one of 4 billion of us, appalled by the problems we face, and wanting to put them into useful perspective without pontification or propaganda. These three points of view go together remarkably well, as they should if we see clearly, for they are all views of the same process.

Of these three points of view, that of the naturalist concerned with situations and processes at the Darwinian level—the visible level of individuals and populations—is, I think, incomparably the most important. Evolution at this level has made us what we are, and in making us has made also our appalling problems, which rise from population explosions and human selfishness, aggression, and unadaptedness to our new social environment, all of which are products of evolution. I shall put into this book as much as I can of what naturalists need to know about evolution to understand what they see in the world around them and in themselves. And I shall use what naturalists see to exemplify, test, and sometimes falsify evolutionists' generalizations.

### About the "Synthetic Theory" of Evolution

The current theory of evolution is a synthesis. It puts together more than a 100 years of observations, inferences, and experiments first by naturalists and later by geneticists, mathematicians, and molecular biologists. It is an immense accomplishment, and it is, I think, essentially correct. It also has immense force, which rises not only from its explanatory power but also from the dogmatic way it is accepted and taught by most biologists. But the synthetic theory is neither complete nor entirely correct, and the dogmatic power of it is dangerous. It should be criticized, and I shall criticize it here, but without belittling it. Perhaps I should add that, if there is an "Establishment" of evolutionists, I am presumably a member of it. I am therefore in a position to say that there is no conscious conspiracy among us against new or unconventional ideas, but that our minds may be closed involuntarily against them. Rex Stout remarks in a nonscientific context (in *Too Many Clients*) that "one of the brain's most efficient departments is the one that turns possibilities into probabilities, and probabilities into facts." I see this process going on not only in single brains (including my own), but also in sets of brains, and among both proponents and opponents of evolution theories. This process makes us all more dogmatic than

we ought to be and fosters bitter controversies, some of which are considered in Chapter 10.

## ABOUT THE AUTHOR

Readers of a book like this should know something about the author of it.

I am a professional biologist, 75 years old, and retired. My formal education was completed in 1931, before the mathematical era of biology had well begun, and long before the explosive evolution of molecular biology. That I have been an observer of these events rather than a contributor to them may, or may not, be a disadvantage. As a biologist, I have been (and still am) first a field naturalist and then a systematist. My work has taken me into remote parts of the world, including five years in the tropics of northern South America, the West Indies, tropical Australia, and (during World War II) New Guinea and the Philippines. I know at first-hand many of the living products of evolution, from insects to vertebrates, as they occur in undisturbed parts of the real world. My systematic work has been mainly with carabid beetles—"ground beetles"—some of which are to be found almost everywhere, and which show geographic and evolutionary patterns exceptionally well. Some of the examples I shall give in this book are drawn from carabids, and will be new to most readers. I am also a professional biogeographer, if there is such a thing; the relation of geographic patterns to evolution is one of my oldest and strongest interests.

Although I am, among working biologists, an old man, I shall try to avoid what I call "the old man's syndrome." Some elderly biologists seem to think anything they say is worth saying because they say it. They are too often sadly mistaken! This tendency of elderly biologists to overvalue themselves perhaps accounts for their choice of pictures of Darwin. The picture of Darwin that most people know, that is usually copied in textbooks, and that hangs in the hall of the Royal Society in London (a society chiefly of elderly men) shows him as a white-bearded septuagenarian. But this is not the man who originated the ideas we know him by. This was done by the young man who sailed on the *Beagle* and who then devoted himself to organizing and explaining what he had seen. I have chosen this man—Darwin the young naturalist, comparable to a modern graduate student—for my frontispiece.

Actually, some of the ideas I am writing about now date not from my older but from my younger years. I still have a package of manuscript written 50 years ago, when I was working for my Ph.D., on "Evolution of Associations" (something like what we now call "group selection"). Wil-

liam Morton Wheeler, my professor, wanted me to revise and publish it, but I put it off (wisely, I think; if I had published it, I might have spent the rest of my life defending wrong conclusions) in favor of extended field-work, systematics, and evolutionary biogeography. But multi-level evolution and related ideas have underlain my thinking and writing through the whole of my career. I have recently published some of these ideas in short papers in *The Proceedings of the National Academy of Sciences*, but it is time I put them into more complete and more coherent form. I think this is the most useful thing I can do in retirement now. And, of course, I want to do it.

P. J. DARLINGTON JR.

Cambridge, Massachusetts  
January 1980

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The late Carl H. Lindroth deserves special mention. I am indebted to him not only for permission to use maps published in *Opuscula Entomologica*, but also for a lifetime of exchange of information and ideas about Carabidae. He will be greatly missed!

I am indebted also to the editors of the following periodicals, who have cleared the way for me to use parts of my own papers: *Ecological Monographs*, *Evolution*, *Proceedings of the American Philosophical Society*, *Proceedings of the National Academy of Sciences USA*, and *Transactions of the American Entomological Society*.

For the highly professional drawings and diagrams I am indebted to Lydia Vickers.

And my wife has given me encouragement, criticism when I asked for it, and practical help in many ways.

# Evolution For Naturalists

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# 1

## HISTORY

The history of evolutionary ideas can be traced only briefly here. However, the theory of evolution has itself evolved by a process of diversification, competition, and selective elimination of ideas, and its evolution introduces important evolutionary concepts. The history of evolutionary ideas before Darwin exemplifies the randomness of events that precede selection. Darwin exemplifies the role of one mind in comparing ideas, eliminating (or, as we say now, falsifying) unfit ones, including the Biblical ones he began with, and making a coherent set of the ideas that survive. And the history of evolutionary ideas since Darwin, although of necessity reduced to trite generalizations here, introduces an important pattern, in which evolution proceeds by successive stages, but with the stages not only succeeding each other but also being added together, forming a succession *and* a sum.

### Before Darwin

Evolutionary ideas through twenty-four centuries, from the Greeks to Darwin, are traced by Osborn, although his book is a somewhat superficial introduction to the subject and should be supplemented by other works listed in my chapter reference list.

The Greeks did have some ideas of directional change, or at least of sequences in the appearance of increasingly complex forms of life, but (as Osborn says, page 350) it is difficult to estimate how much they anticipated modern evolutionary thought. They came closer to anticipating the fact of evolution than the mechanism of it. Aristotle, for example, thought that an internal perfecting force caused plants and animals to approach idealized "types." The use of preconceived models, whether conceptual or mathematical, still characterizes "typologists" (now an opprobrious term) among evolutionists, taxonomists, and others.