

INTRODUCTORY REMARKS

My original plan for this book was simple: I, a chemist with a long-standing involvement in biological problems, would examine and assess the current views on evolution in as impartial a fashion as possible. I became interested in this project when, in the course of a few hours' reading on the subject, I encountered vehemently opposed opinions by seemingly reasonable people. Many supported Darwinian ideas:

Our own existence once presented the greatest of all mysteries, but...it is a mystery no longer because it is solved. Darwin and Wallace solved it.

The Darwinian theory of evolution is the great, global, organizing principle of biology.

The search for new approaches does not mean that natural selection is to be overthrown. The core of neo-Darwinist synthesis will remain valid.

Except for those skeptics who are willing to discard rationality, Darwin's theory has now become Darwin's law.

Darwin basically told us all we know and all we need to know about life.

Others, on the other hand, took a rather different position:

Darwinism is a theory that has been put to test and found false.

Although selective filtering and enhancement of useful genes could obviously occur in the Darwinian manner for individual cases, the explanation has the flavor of a just-so story. It is far more difficult to demonstrate that there will be a systematic accumulation of myriads of such changes to produce a coherent pattern of species advancement.

Self-organizing behavior rather than selection is responsible for evolution.

The transformation of masses of populations by imperceptible steps guided by selection is so inapplicable to the fact that we can only marvel both at the want of penetration displayed by the advocates of such a proposition, and at the forensic skill by which it was made to appear acceptable.

The explanatory doctrines of biological evolution do not stand up to an objective, in-depth criticism. They prove to be either in conflict with reality or else incapable of solving the major problems involved.

None of the pro-Darwinian statements was written by a person with an obvious axe to grind. And none of the anti-Darwinian statements was written by a person with a religious agenda. Quite the contrary, all the quotes come from established experts in the field of biology and evolution (whose names have not been identified here in order to avoid irrelevant personality issues). The point is that there exists a scientific dilemma of major scope, and it became a personal goal to identify the source of the problem. In the process of realizing this goal, a new view of evolution with widespread implications was developed, and thus did this book come into existence.

Researching a contentious field requires a broad awareness of the subject coupled to an open mind. My acquiring an expertise in

evolution was accomplished by reading and absorbing a small library of books and articles, both old and new. Many of these are listed in the bibliography. But I found that books and articles on evolution were insufficient. Since evolution is such an all-encompassing field (embodying anthropology, archeology, ecology, genetics, geology, molecular biology, paleontology, sociology, and statistics), it was necessary to delve into these subjects as well. This was both an easy and difficult task depending upon how one looks at it. Compared to the esoteric and mathematical concepts found in my main area of expertise (chemistry), evolutionary science seems relatively tractable. Many great ideas in biology, including evolution, can be explained in a simple and palatable manner. On the other hand, I encountered a bewildering array of facts and observations. I had to, therefore, search through an enormous amount of material for the information I needed and trusted (a bookish counterpart to an archeological dig!). Important ideas had to be separated from trivial ones; established truths had to be distinguished from conjecture; and valid arguments had to be differentiated from specious assertions. It was the sheer mass of information, and the need to compile and condense it, that presented the challenge.

There has, of course, also been an information explosion in my own field of chemistry (as evidenced by the excess of 100 000 chemistry articles per year from the United States alone). Chemists engaged in basic research must, therefore, confine themselves to a tiny sub-specialty and, even so, they manage to read only a fraction of their sub-specialty's output. Time is too short to do otherwise. The writing of this book was pure joy because I could escape this scientific constraint. I learned of animal life I never knew existed; of adaptations that amuse and confound; of humanoids long gone; of brilliant experiments in genetics; of the mind and brain; of language and culture. In short, as a result of my research for this book, I have developed an awareness and appreciation for Nature that a long and tortuous educational system had never imparted to me. From a selfish point of view, my new-found wonder has already richly rewarded me for my time

and effort. If some of this wonder carries over to others, my rewards will be compounded even further.

Jacques Monod wrote that in the beginning, “the Universe was not pregnant with life nor the biosphere with man.” From where, then, did the current diversity of life arise? According to fossil and other evidence, life began as single-celled animals and increased in complexity until advanced species, such as man, populated the earth. The process is called evolution or, in Darwin’s terminology, “descent with modification”. Proof of evolution is plentiful but will not be presented here; I will simply operate under the premise that evolution is an established fact. Just how evolution occurred is another matter entirely. As already pointed out, the mechanism of evolutionary change is a highly controversial issue even among serious scholars. Thus it is the mechanism of evolution, not its reality, that is the main focus of this work.

The book begins with a review of Darwin’s theory of natural selection, the intellectual underpinning of all modern discussions of evolution. It was necessary to write this chapter in some detail because many of the criticisms of the theory stem, it seems, from misunderstandings. In the next chapter, entitled “Darwin Analyzed”, I confront and dismiss a wide variety of criticisms that have been levied against natural selection. The purpose here is not only to correct certain misconceptions but also to use the misconceptions and their alterations as a vehicle for attaining a greater appreciation of Darwin’s ideas. Several remarkable examples of natural history, portrayed in as simple and non-technical terms as possible, are included in this section of the book.

Up to this point the book might appear to have been written by a die-hard apologist for Darwinian thought, but such is not the case. Ultimately, in my overview of evolutionary science, I encounter at least one vitally important trait that is not explainable by natural selection alone: human intelligence. Something is seriously lacking when natural selection is invoked to rationalize the capabilities of the human brain, that wonderful organ housed in the “thin bone vault”. Thus, a great deal of space will be devoted to human intelligence (an interesting subject in its own right) and

to why natural selection cannot adequately explain why humans are so smart.

At the very end of the book I propose an alternative to natural selection. Its purpose is to demonstrate that natural selection is not the only possible route to biological change. Other mechanisms, however speculative, are worthy of consideration. This final section of the book draws upon modern genetics. But whether technically trained or not, the reader will acquire, I hope, an enhanced appreciation for the origins of the human mind and for humanity itself (including possibilities for the future development of our species).

Note that I do not state, and will never state, that natural selection is false. There is a crucial difference between claiming that a theory is false and claiming (as I do) that a theory must be expanded to encompass certain complexities of Nature. Modification rather than elimination of established concepts in science happens all the time. For example, the theory of disease based on bacteria was not discarded when viruses were discovered. Instead, the theory of disease was broadened to accommodate the new information.

Many people who do not work in the field of science, and some who do, have an almost innate dislike for certain aspects of evolution. These persons should take no comfort in the inadequacies of natural selection as delineated herein. My arguments are, I hope, merely a prelude to an even better scientific description of life. No serious book on evolution, including this one, can be written without standing on the shoulders of Charles Darwin. And if, while doing so, his beard is tweaked a little (or even a great deal), that is the way science works and progresses.

It is now necessary to confront, and permanently set aside, the conflict over evolution between science and religion. Many thoughtful people, I presume, wish that science and religion were at peace. Science is theologically neutral; it depends upon observation and experimentation; and it accepts as little as possible on faith. Religion, on the other hand, is a system of belief; it is not amenable to experimental testing; it addresses issues of morality and values on which science has nothing to say. The two domains

are time-honored but completely different. They are pursued for different reasons. They serve different functions. And we need them both as the following anecdote illustrates.

The Northern Lights are among the most magnificent of all natural phenomena, filling the sky with a wondrous display of reds, yellows, greens, and blues. Flickering lights and colors take the shape of arcs, streamers, and great hanging tapestries. Scientists believe that Northern Lights are caused by high-speed electrons from storms on the sun. These electrons become trapped in the earth's so-called "Van Allen radiation belt" from where they are drawn to the polar regions by the planetary magnetic fields. Indians of northern America, however, have a different interpretation of Northern Lights; they believe that the lights are the campfires of dead ancestors. Who is right — the scientist or the Indian? It depends.

When I am camped at the edge of a northern lake on a clear winter's night, and I gaze up into the sky at the Northern Lights, I am unable to think of electrons trapped in the Van Allen belt. I need to believe that I am standing where a race of ancient people had camped before. I need to believe that they are still thriving and are sending back to earth evidence of their continued existence. Believing this makes me happy and fulfilled.

But back in the laboratory, I might have to deal with the alternate scientific viewpoint, and I could do so with enthusiasm. If all this seems schizophrenic, blame it on whatever in us that demands both non-testable notions and scientific facts lying side-by-side. Albert Einstein said it right: "A legitimate conflict between science and religion cannot exist. Science without religion is lame, religion without science is blind." Sir William Bragg's famous dictum should also be cited: "Religion and science are opposed...but only in the same sense as that in which my thumb and forefinger are opposed...and between the two, one can grasp everything." With these two wonderful quotes, I permanently lay to rest any further discussion of religious issues.

For whom, then, is this book intended? The format is geared to the non-professional readership in that I minimize jargon and

unnecessary complexities. Accordingly, I join DeKruif, Gould, Huxley, Medawar, Schrödinger, and Wells (to immodestly name a few) who also wrote popular books on biology. Perhaps the style of this book has been most influenced by E. Schrödinger, of quantum mechanics fame, who stated: “If you cannot — in the long run — tell everyone what you have been doing, your doing has been worthless.” But despite having set my sight on the non-expert, I prefer not to let evolutionists off the hook entirely. It might not be a bad exercise for evolutionists (that strange mix of overly strident supporters and overly critical detractors of Darwin) to peruse the book as well. After all, it has been written by an “outsider” whose independence from evolutionist cliques might not guarantee an impartial perspective, but it certainly cannot hurt. And, as mentioned, toward the end of the book I propose alterations of natural selection to account for those cases, such as the contents of humans’ thin bone vault, where Darwinism seems to fail. This material is new, fresh, and provocative even to the expert.

In his preface to *“The Sense of Beauty”*, philosopher George Santayana wrote the following words:

The influences under which the book has been written are rather too general and pervasive to admit of specification; yet the student of philosophy will not fail to perceive how much I owe to writers, both living and dead, to whom no honor could be added by my acknowledgements. I have usually omitted any reference to them in footnotes or in the text in order that the air of controversy might be avoided, and the reader might be enabled to compare what is said more directly with the reality of his own experience.

Although I could echo a similar sentiment, I will depart from Santayana’s approach by listing (more in the style of a text than a treatise) most of my sources in a bibliography. These sources must not be blamed for my comments, speculations, and (especially) my theorizing that lie at the heart of this book. The bibliography also contains books that are recommended for further reading.

Obviously, it was not possible to verify first-hand all the natural history and the myriad of other details presented to enliven this book. I can only assure the reader that I have done my best to search out material from seemingly reliable sources. Although some will, no doubt, be able to quarrel with points made here and there (debates in the fields of evolution and anthropology abound), I hope that these will not be employed to discredit my major themes which, fortunately, are never dependent upon the validity of any single observation or upon the precision of a particular number. For example, for the purposes of this book it makes little difference if a human trait first appeared 30 000 years ago or 50 000 years ago (although this might be considered a serious uncertainty in anthropological circles). Thus, the sweep of the book far exceeds the particulars.