

Intelligent Evolution



The consequences of Charles Darwin's "one long argument"

by Edward O. Wilson

PELLEGRINO UNIVERSITY PROFESSOR EMERITUS Edward O. Wilson, a scholarly giant of biodiversity and sociobiology, remains at heart a teacher. His latest lesson concerns the continuing consequences of Charles Darwin's "timeless and consistently inspirational" science. At a moment when discussion of evolution and "intelligent design" preoccupies American political discourse to a surprising degree, shedding more heat than light on the nature of life and life science, Wilson invites the serious public to do what far too few of us have done: to read what Darwin wrote.

In November, W. W. Norton & Company will publish *From So Simple a Beginning: The Four Great Books of Charles Darwin*. For this single, enormous volume, Wilson has selected the versions of, and written introductions to, each of the iconic texts: *The Voyage of the Beagle* ("intellectually the most important travel book of all time"); the first edition of *On the Origin of Species* ("the greatest scientific book of all time"); *The Descent of Man, and Selection in Relation to Sex* (the further step that "Darwin had to take...from the premise that evolution is universal"); and *The Expression of the Emotions in Man and Animals* ("both an old-fashioned descriptive treatise and the most modern of Darwin's major works," which "could serve as a guidebook for novelists"—and "as part of the foundation of modern psychology").

Wilson has also written a general introduction, placing Darwin at the very center of the revolution in modern life science and understanding, and an afterword, on the "noble yet troubling legacy" that unfolds today in the collision between religious faith and scientific humanism. In those essays, reprinted here, Wilson draws on his lifelong immersion in the scientific enterprise and his study of the foundational Darwinian texts to present his view surrounding these "great unanswered questions of philosophy."

~The Editors

We must acknowledge, as it seems to me, that man with all his noble qualities, with sympathy which feels for the most debased, with benevolence which extends not only to other men but to the humblest living creature, with his god-like intellect which has penetrated into the movements and constitution of the solar system—with all these exalted powers—Man still bears in his bodily frame the indelible stamp of his lowly origin.

~Charles Darwin

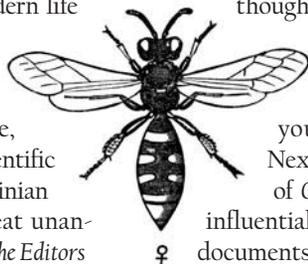
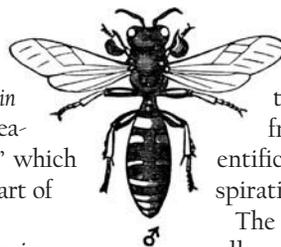
The Descent of Man, and Selection in Relation to Sex (1871)

GREAT SCIENTIFIC DISCOVERIES are like sunrises. They illuminate first the steeples of the unknown, then its dark hollows.

Such expansive influence has been enjoyed by the scientific writings of Charles Darwin. For over 150 years his books, the four most influential of which are reprinted here for the first time as a bound set, have spread light on the living world and the human condition. They have not lost their freshness: more than any other work in history's scientific canon, they are both timeless and persistently inspirational.

The four classics, flowing along one to the next like a well-wrought narrative, trace the development of Darwin's thought across almost all of his adult life. The first, *Voyage of the Beagle* (1845), one of literature's great travel books, is richly stocked with observations in natural history of the kind that were to guide the young Darwin toward his evolutionary worldview. Next comes the "one long argument," as he later put it, of *On the Origin of Species* (1859), arguably history's most influential book. In it the now middle-aged Darwin massively documents the evidences of organic evolution and introduces

Crabo cribrarius



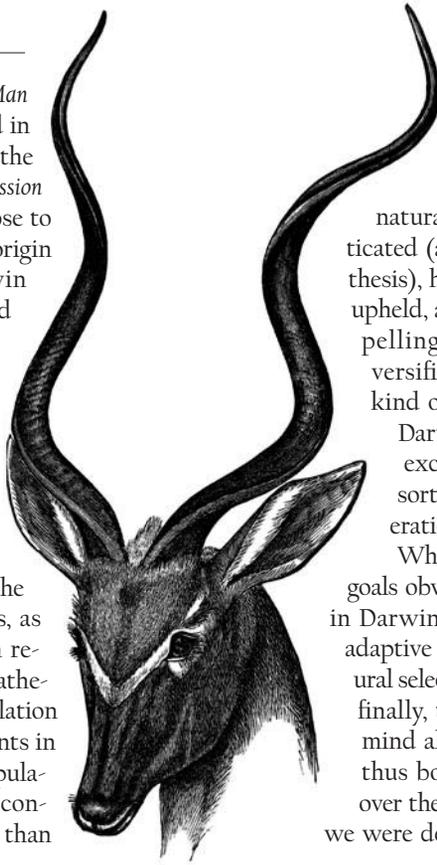
the theory of natural selection. *The Descent of Man* (1871) then addresses the burning topic foretold in *On the Origin of Species*: “Light will be thrown on the origin of man and his history.” Finally, *The Expression of the Emotions in Man and Animals* (1872) draws close to the heart of the matter that concerns us all: the origin and nature of mind, the “citadel” that Darwin could see but knew that science at the time could not conquer.

The adventure that Darwin launched on all our behalf, and which continues into the twenty-first century, is driven by a deceptively simple idea, of which Darwin’s friend and staunch supporter Thomas Henry Huxley said, and spoke for many to follow, “How extremely stupid of me not to have thought of that!” Evolution by natural selection is perhaps the only one true law unique to biological systems, as opposed to nonliving physical systems, and in recent decades it has taken on the solidity of a mathematical theorem. It states simply that if a population of organisms contains multiple hereditary variants in some trait (say, red versus blue eyes in a bird population), and if one of these variants succeeds in contributing more offspring to the next generation than the other variants, the overall composition of the population changes, and evolution has occurred. Further, if new genetic variants appear regularly in the population (by mutation or immigration), evolution never ends. Think

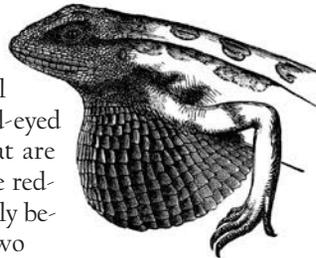
of red-eyed and blue-eyed birds in a breeding population, and let the red-eyed birds be better adapted to the environment. The population will in time come to consist mostly or entirely of red-eyed birds. Now let green-eyed mutants appear that are even better adapted to the environment than the red-eyed form. As a consequence the species eventually becomes green-eyed. Evolution has thus taken two more small steps.

The full importance of Darwin’s theory can be better understood by realizing that modern biology is guided by two overwhelmingly powerful and creative ideas. The first is that all biological processes are ultimately obedient to, even though far from fully explained by, the laws of physics and chemistry. The second is that all biological processes arose through evolution of these physicochemical systems through natural selection. The first principle is concerned with the *how* of biology. The second is concerned with the ways the systems adapted to the environment over periods of time long enough for evolution to occur—in other words the *why* of biology.

Knowledge addressing the first principle is called functional biology; that addressing the second is called evolutionary biology. If a moving automobile were an organism, functional biology would explain how it is constructed and operates, while evolu-



All biological processes are ultimately obedient to the laws of physics and chemistry, and arose through evolution of these physicochemical systems through natural selection.



Top: *Tragelaphus strepsiceros*.
Bottom: *Sitana minor* (male with the gular pouch expanded).

tionary biology would reconstruct its origin and history—how it came to be made and its journey thus far.

The impact of the theory of evolution by natural selection, nowadays grown very sophisticated (and often referred to as the Modern Synthesis), has been profound. To the extent it can be upheld, and the evidence to date has done so compellingly, we must conclude that life has diversified on Earth autonomously without any kind of external guidance. Evolution in a pure Darwinian world has no goal or purpose: the exclusive driving force is random mutations sorted out by natural selection from one generation to the next.

What then are we to make of the purposes and goals obviously chosen by human beings? They are, in Darwinian interpretation, processes evolved as adaptive devices by an otherwise purposeless natural selection. Evolution by natural selection means, finally, that the essential qualities of the human mind also evolved autonomously. Humanity was thus born of Earth. However elevated in power over the rest of life, however exalted in self-image, we were descended from animals by the same blind

force that created those animals, and we remain a member species of this planet’s biosphere.

The revolution in astronomy begun by Nicolaus Copernicus in 1543 proved that Earth is not the center of the universe,

nor even the center of the solar system. The revolution begun by Darwin was even more humbling: it showed that humanity is not the center of creation, and not its purpose either. But in freeing our minds from our imagined demigod bondage, even at the price of humility, Darwin turned our attention to the astounding power of the natural creative process and the magnificence of its products:

There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved.

Darwin, *On the Origin of Species* (first edition, 1859)



If I lived twenty more years and was able to work, how I should have to modify the *Origin*, and how much the views on all points will have to be modified! Well, it is a beginning, and that is something.

~Charles Darwin
Letter to J. D. Hooker, 1869



DARWIN LIVED THIRTEEN MORE YEARS after writing this letter to Joseph Hooker, and he did manage to modify the theory of evolution by natural selection, expanding it in *The Descent of Man* (1871) to include human origins and in *The Expression of the Emotions in Man and Animals* (1872) to address the evolution of instinct. The ensuing 130 years have seen an enormous growth of the Darwinian heritage. Joined with molecular and cellular biology, that accumulated knowledge is today a large part of modern biology. Its centrality justifies the famous remark made by the evolutionary geneticist Theodosius Dobzhansky in 1973 that “nothing in biology makes sense except in the light of evolution.” In fact, nothing in science as a whole has been more firmly established by interwoven factual documentation, or more illuminating, than the universal occurrence of biological evolution. Further, few natural processes have been more convincingly explained than evolution by the theory of natural selection or, as it is popularly called, Darwinism.

Thus it is surpassingly strange that half of Americans recently polled (2004) not only do not believe in evolution by natural selection but do not believe in evolution at all. Americans are certainly capable of belief, and with rocklike conviction if it originates in religious dogma. In evidence is the 60 percent that accept the prophecies of the Book of Revelation as truth, and yet in more evidence is the weight that faith-based positions hold in political life. Most of the religious Right opposes the teaching of evolution in public schools, either by an outright ban on the subject or, at the least, by insisting that it be treated as “only a theory” rather than a “fact.”

Yet biologists, particularly those statured by the peer review and publication of substantial personal research on the subject in leading journals of science, are unanimous in concluding that evolution is a *fact*. The evidence they and thousands of others have adduced over 150 years falls together in intricate and interlocking detail. The multitudinous examples range from the small changes in DNA sequences observed as they occur in real time to finely graded sequences within larger evolutionary

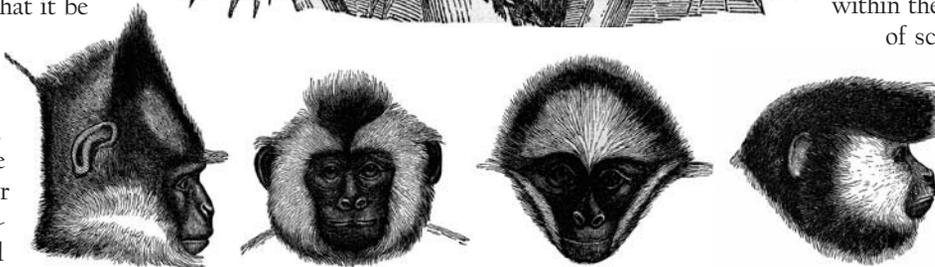
changes in the fossil record. Further, on the basis of comparably firm evidence, natural selection grows ever stronger as the prevailing explanation of evolution.

Many who accept the fact of evolution cannot, however, on religious grounds, accept the operation of blind chance and the absence of divine purpose implicit in natural selection. They support the alternative explanation of intelligent design. The reasoning they offer is not based on evidence but on the lack of it. The formulation of intelligent design is a default argument advanced in support of a non sequitur. It is in essence the following: There are some phenomena that have not yet been explained and that (and most importantly) the critics personally cannot imagine being explained; therefore there must be a supernatural designer at work. The designer is seldom specified, but in the canon of intelligent design it is most certainly not Satan and his angels, nor any god or gods conspicuously different from those accepted in the believer’s faith.

Flipping the scientific argument upside down, the intelligent designers join the strict creationists (who insist that no evolution ever occurred in the first place) by arguing that scientists resist the supernatural theory because it is counter to their own personal secular beliefs. This may have a kernel of truth; everybody suffers from some amount of bias. But in this case bias is easily overcome. The critics forget how the reward system in science works. Any researcher who can prove the existence of intelligent design within the accepted framework of science will make his-

tory and achieve eternal fame. He will prove at last that *science and religious dogma are compatible!* Even a combined Nobel Prize and Templeton Prize

(the latter designed to encourage search for just such harmony) would fall short as proper recognition. Every scientist would like to accomplish such an epoch-making advance. But no one has even come close, because unfortunately there is no evidence, no theory, and no criteria for proof that even marginally might pass for science. There is only the residue of hoped-for default,



Top: *Cercopithecus petaurista*.

Bottom, from left to right:

Semnopithecus comatus, *Cebus capucinus*, *Ateles marginatus*, and *Cebus vellerosus*.



which steadily shrinks as the science of biology expands.

In all of the history of science only one other disparity of comparable magnitude to evolution has occurred between a scientific event and the impact it has had on the public mind. This was the discovery by Copernicus that Earth and therefore humanity are not the center of the universe, and the universe is not a closed spherical bubble.

Copernicus delayed publication of his masterwork *On the Revolutions of the Heavenly Spheres* until the year of his death (1543).

For his extension of the idea subsequently, Bruno was burned at the stake, and for its documentation Galileo was shown the instruments of torture at Rome and remained under house arrest for the remainder of his life.

Today we live in a less barbaric age, but an otherwise comparable disjunction between science and religion, the one born of Darwinism, still roils the public mind. Why does such intense and pervasive resistance to evolution continue 150 years after the publication of *The Origin of Species*, and in the teeth of the overwhelming accumulated evidence favoring it? The answer is simply that the Darwinian revolution, even more than the Copernican revolution, challenges the prehistoric and still-regnant self-image of humanity. Evolution by natural selection, to be as concise as possible, has changed everything.

In the more than slightly schizophrenic circumstances of the present era, global culture is divided into three opposing images of the human condition, each logically consistent within its own, independent premises. The dominant of these hypotheses, exemplified by the creation myths of the Abrahamic monotheistic religions (Judaism, Christianity, and Islam), sees humanity as a creation of God. He brought us into being and He guides us still as father, judge, and friend. We interpret his will from sacred scriptures and the wisdom of ecclesiastical authorities.

The second worldview is that of political behaviorism. Still beloved by the now rapidly fading Marxist-Leninist states, it says that the brain is largely a blank state devoid of any inborn inscription beyond reflexes and primitive bodily urges. As a con-

sequence the mind originates almost wholly as a result of learning, and it is the product of a culture that itself evolves by historical contingency. Because there is no biologically based "human nature," people can be molded to the best possible

political and economic system, namely, as urged upon the world through most of the twentieth century, communism.

In practical politics, this belief has been repeatedly tested and, after economic collapses and tens of millions of deaths in a dozen dysfunctional states, is generally deemed a failure.

Both of these worldviews, God-centered religion and atheistic communism, are opposed by a third and in some ways more radical worldview, scientific humanism. Still held by only a tiny minority of the world's population, it considers humanity to be a biological species that evolved over millions of years in a biological world, acquiring unprecedented intelligence yet still guided by complex inherited emotions and biased channels of learning. Human nature exists, and it was self-assembled. It is the commonality of the hereditary

responses and propensities that define our species. Having arisen by evolu-

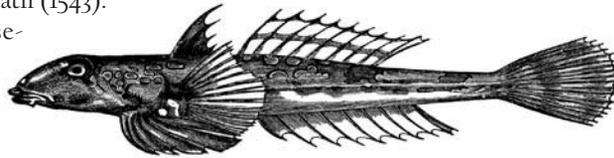
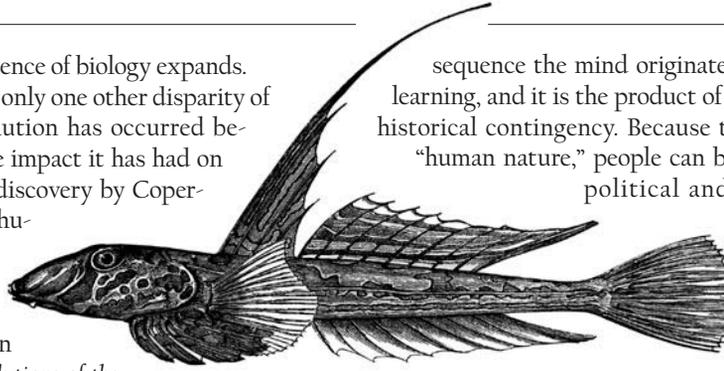
tion during the

far simpler conditions in which hu-

manity lived during more than 99 percent of its existence, it forms the behavioral part of what, in *The Descent of Man*, Darwin called the indelible stamp of our lowly origin.

To understand biological human nature in depth is to drain the fever swamps of religious and blank-slate dogma. But it also imposes the heavy burden of individual choice that goes with intellectual freedom.

Such was the long journey for Darwin, the architect of the naturalistic worldview. He began his voyage on the *Beagle* as a devout Christian who trained for the ministry. "Whilst on board the *Beagle* I was quite orthodox," he wrote much later in his autobiography, "and I remember being heartily laughed at by several of the officers (though themselves orthodox) for quoting the Bible as an



The hereditary responses and propensities that define our species arose by evolution, forming the behavioral part of what Darwin called the indelible stamp of our lowly origin.



Top: *Callionymus lyra* (upper figure, male; lower figure, female).
Bottom: Dog "in a humble and affectionate frame of mind."



unanswerable authority on some point of morality.” His later drift from the religion of his birth was stepwise and slow. Still on H.M.S. *Beagle* during its circumnavigation of the globe (1831–1836) he came to believe that the “false history” and reports of God’s vengeful feelings made the Old Testament “no more to be trusted than the sacred books of the Hindus, or the beliefs of any barbarian.” The miracles of Jesus seemed to him to suggest that people living at the time of the Gospels were “ignorant and credulous to a degree almost incomprehensible by us.” The growth of disbelief was so slow that Darwin felt no distress. In a striking passage of his autobiography he expressed his final and complete rejection of Christian dogma based solely on blind faith:

I can indeed hardly see how anyone ought to wish Christianity to be true; for if so the plain language of the text seems to show that the men who do not believe, and this would include my Father, Brother and almost all my best friends, will be everlastingly punished.

And that is a damnable doctrine.

Did Charles Darwin recant in his last days, as some religious critics have hopefully suggested? There is not a shred of evidence that he did or that he was presented with any reason to do so. Further, it would have been wholly contrary to the deliberate, careful manner with which he approached every subject.

The great naturalist did not abandon Abrahamic and other religious dogmas because of his discovery of evolution by natural selection, as one might reasonably suppose. The reverse occurred. The shedding of blind faith gave him the intellectual fearlessness to explore human evolution wherever logic and evidence took him. And so he set forth boldly, in *The Descent of Man* to track the origin of humanity, and in *The Expression of the Emotions in Man and Animals* to address the evolution of instinct. Thus was born scientific humanism, the only worldview compatible with science’s growing knowledge of the real world and the laws of nature.

So, will science and religion find common ground, or at least agree to divide the fundamentals into mutually exclusive domains? A great many well-meaning scholars believe that such rap-

prochement is both possible and desirable. A few disagree, and I am one of them. I think Darwin would have held to the same position. The battle line is, as it has ever been, in biology. The inexorable growth of this science continues to widen, not to close, the tectonic gap between science and faith-based religion.

Rapprochement may be neither possible nor desirable.

There is something deep in religious belief that divides people and amplifies societal conflict. In the early part of this century, the toxic mix of religion and tribalism has become so dangerous as to justify taking seriously the alternative view, that humanism based on science is the effective antidote, the light and the way at last placed before us.

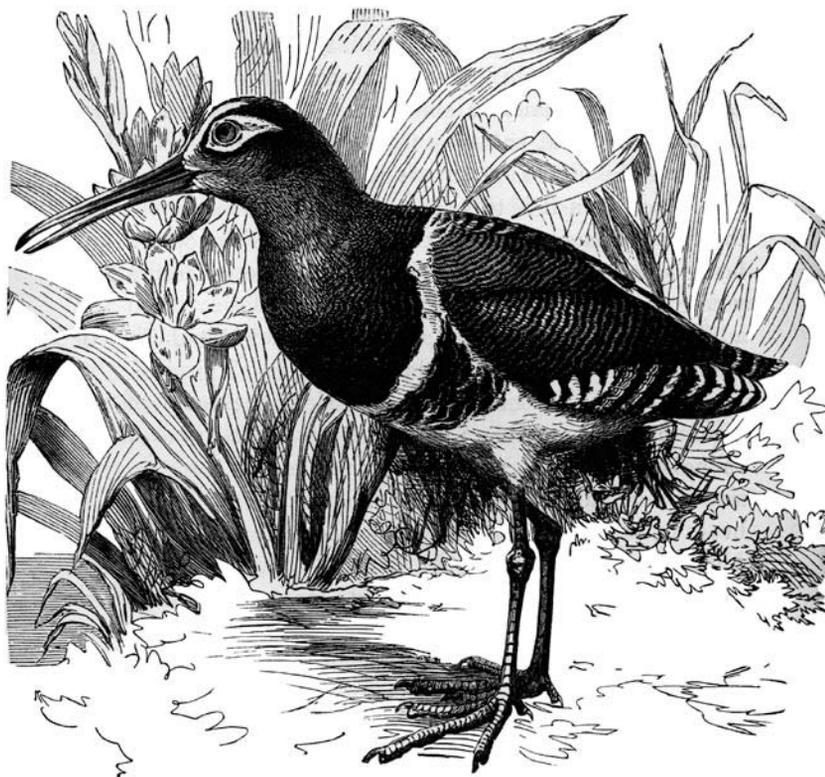
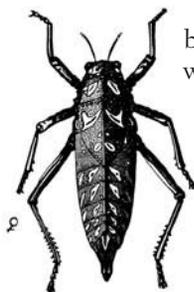
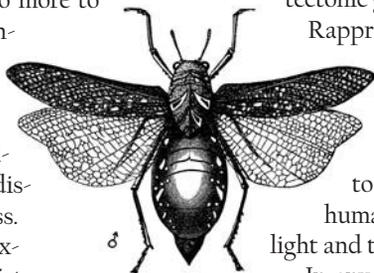
In any case, the dilemma to be solved is truly profound. On the one side the input of religion on human history has been beneficent in many ways. It has generated much of which is best in culture, including the ideals of altruism and public service. From the beginning of history it has inspired the arts. Creation myths were in a sense the beginning of science itself. Fabricating them was the best the early scribes could do to explain the universe and human existence.

Yet the high risk is the ease with which alliances between religions and tribalism are made. Then comes bigotry

and the dehumanization of infidels. Our gods, the true believer asserts, stand against your false idols, our spiritual purity against your corruption, our divinely sanctioned knowledge against your errancy. In past ages the posture provided an advantage. It united each tribe during life-and-death struggles with other tribes. It buoyed the devotees with a sense of superiority. It sacralized tribal laws and mores, and encouraged altruistic behaviors. Through sacred rites it lent solemnity to the passages of life. And it comforted the anxious and afflicted. For all this and more it gave

people an identity and purpose, and vouchsafed tribal fitness—yet, unfortunately, at the expense of less united or otherwise less fortunate tribes.

Religions continue both to render their special services and to exact their heavy costs. Can scientific humanism do as well or better, at a lower cost? Surely that ranks as one of the great unanswered questions of philosophy. It is the noble yet troubling legacy that Charles Darwin left us. ▽



Top: *Pneumora*.

Bottom: *Rhynchaea capensis*.

