HUMAN EVOLUTION

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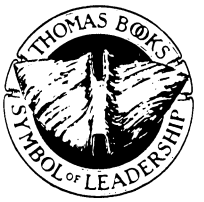

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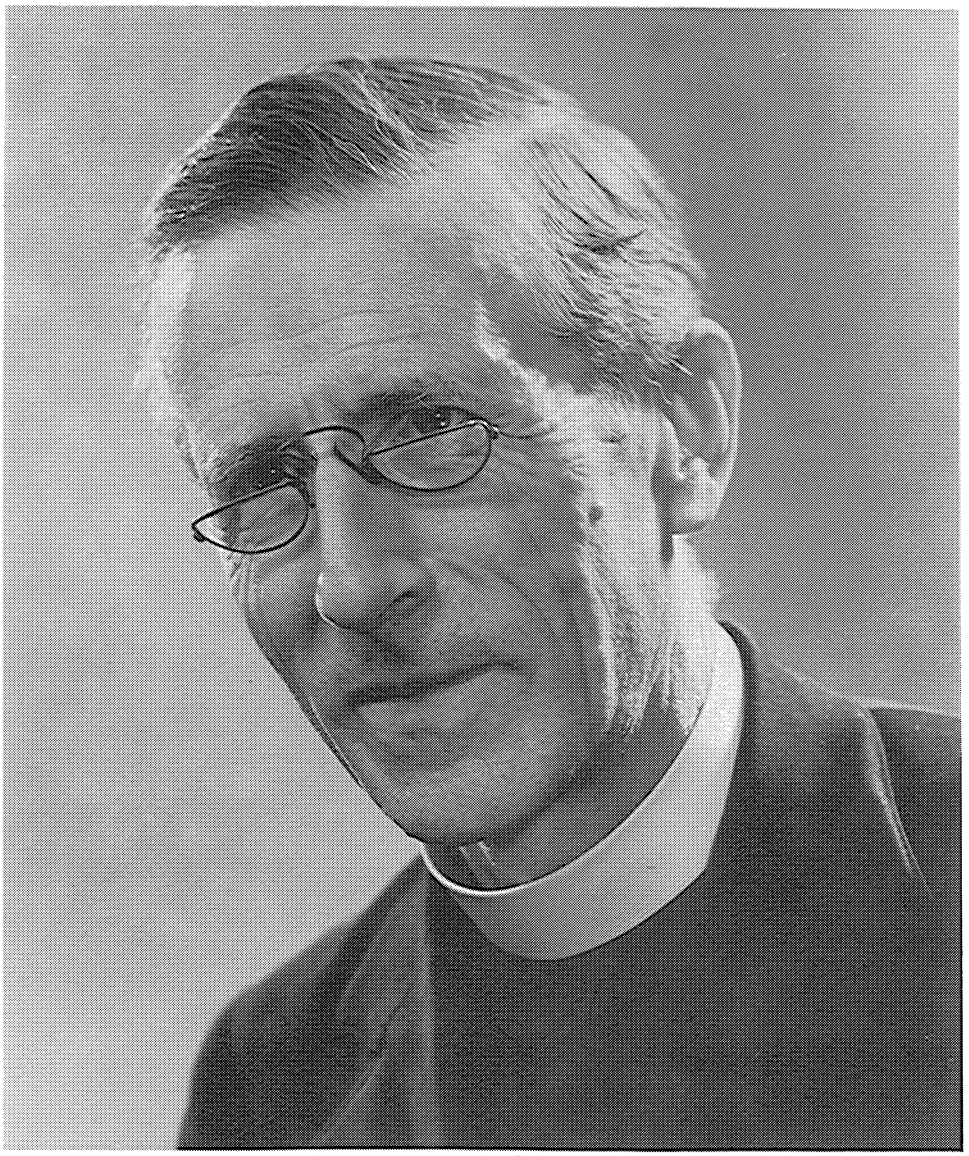
To the immortal memory of
Pierre Teilhard de Chardin
(1881–1955)



Pierre Teilhard de Chardin, S.J. (1881–1955). The geopaleontologist and religious mystic gave a controversial interpretation of organic evolution and human destiny grounded in geocentrism, anthropocentrism, an involuting cosmology, and converging panentheism. Courtesy of American Museum of Natural History (Neg. # 325268). Photo by John S. Nichols.

We may, perhaps, imagine that the Creation was finished long ago. But that would be quite wrong. It continues still more magnificently, and in the highest zones of the world.

Pierre Teilhard de Chardin
The Divine Milieu (November 1926–March 1927)

If the creature from which man issued had not been a biped, his hands would not have been free in time to release the jaws from their prehensile function, and the thick band of maxillary muscles which had imprisoned the cranium could not have been relaxed. It is thanks to two-footedness freeing the hands that the brain was able to grow; and thanks to this, too, that the eyes, brought closer together on the diminished face, were able to converge and fix on what the hands held and brought before them—the very gesture which formed the external counterpart of reflection.

Pierre Teilhard de Chardin
The Phenomenon of Man (June 1938–June 1940)

Man is, in appearance, a "species," no more than a twig, an offshoot from the branch of the primates—but one that we find to be endowed with absolutely prodigious biological properties.

Pierre Teilhard de Chardin
Man's Place in Nature (August 1949)

To Lamarck and Darwin "evolution" described a process by which new species emerged—that is to say, a process of variation and differentiation. Organic evolution is never represented pictorially by a bundle of parallel lines, but by a tree with branches all up the trunk and each branch bristling with twigs. In so far as the archeological picture could be represented by such a figure, it would disclose a process analogous to organic evolution.

V. Gordon Childe, *Social Evolution* (1951)

In the future I see open fields for far more important researches.... Light will be thrown on the origin of man and his history.

Charles R. Darwin, *On the Origin of Species* (1859)

Thus we have given to man a pedigree of prodigious length, but not, it may be said, of noble quality. The world, it has often been remarked, appears as if it had long been preparing for the advent of man: and this, in one sense is strictly true, for he owes his birth to a long line of progenitors. If any single link in this chain had never existed, man would not have been exactly what he now is.

Charles R. Darwin, *The Descent of Man* (1871)

Punctuated equilibria still strikes me as an exceedingly simple idea: at base, it says that once a species evolves, it will usually not undergo great change as it continues its existence—contrary to prevailing expectation that indeed does go back to Darwin (and even beyond). Such species stability, at any rate, seems more the rule than the exception to judge from the fossil record.

Niles Eldredge, *Time Frames* (1985)

I cannot concur with those who advocate saving gorillas from extinction by killing and capturing more free-living individuals only to exhibit them in confinement.... The late Dr. Louis Leakey almost prophetically realized that the mountain gorilla, the subspecies scientifically recognized and described in 1902, might possibly be doomed to extinction in the same century in which it had been discovered.... If mountain gorillas are to survive and propagate, far more active conservation measures urgently need to be undertaken. The question remains, is it already too late?

Dian Fossey, *Gorillas in the Mist* (1983)

I think that this idea of the hopeful monster has come into its own only recently.... Thus, the combined facts of genetics, embryology, and taxonomy demonstrate that the hopeful monster is one of the means of macroevolution by single large steps. ... There is no such category as incipient species.... If evolution had not been made possible by relatively simple features inherent in the material basis of organization, it would never have occurred.... This shows that a simplistic attitude is not a flaw but the ideal goal for a theory in science and, therefore, also for a theory of evolution.

Richard Goldschmidt, *The Material Basis of Evolution* (1940)

Are the chimpanzees at the end of their evolutionary trail? Or are there pressures in their forest habitat that might, given time, push them farther along the path taken by our own prehistoric ancestors, producing apes that would become ever more human? It seems unlikely, for evolution does not often repeat itself.

Jane Goodall, *The Chimpanzees of Gombe* (1986)

Mass extinction may be the primary and indispensable seed of major changes and shifts in life's history. Destruction and creation are locked in a dialectic of interaction.

Stephen Jay Gould, *The Flamingo's Smile* (1985)

Among the primordial hominids of the Pliocene and Pleistocene periods, cultural innovations in tool use would undoubtedly have amplified trends leading toward the greater precision and power of the human thumb, and this in turn would have placed a selective premium on the neural circuitry needed for the intelligent use of hand-held tools.... By progressively severing hominid cultural repertories from genetic coding, natural selection conferred an enormous adaptive advantage on Homo sapiens*—namely, the advantage of being able to acquire and modify a vast range of useful behavior far more rapidly than is possible when genes maintain or regain control over each behavioral innovation.*

Marvin Harris, *Cultural Materialism* (1979)

To an Orang—as we shall see—there is dim hope where there is no tree, no butterfly, no flea!

Barbara Harrisson, *Orang-utan* (1963)

Man's most sacred duty, and at the same time his most glorious opportunity, is to promote the maximum fulfillment of the evolutionary process on this earth; and this includes the fullest realisation of his own inherent possibilities.

Julian S. Huxley, *Religion without Revelation* (1957)

If one series of species has come into existence by the operation of natural causes, it seems folly to deny that all may have arisen in the same way.

Thomas H. Huxley, *On a Piece of Chalk* (1868)

Lucy was utterly mind-boggling; there was no other way to describe her. She left the entire camp reeling. Everything about her was sensational. That half of a complete skeleton should appear on the table of the anthropology tent, as her various parts were sorted out and laid in place, seemed incredible to the scientists even as they saw the evidence accumulating before their eyes.... Here was an ape-brained little creature with a pelvis and leg bones almost identical in function with those of modern humans.... Now I knew, with the certainty provided by this extraordinary fossil, that hominids had walked erect at three million B.C. More surprising yet, they had walked before *their brains had begun to enlarge. There could no longer be any argument about that, or any conjecture over whether a certain leg bone and a certain skull did or did not belong to the same individual. Here they were, together, in one unbelievable skeleton.*

Donald C. Johanson and Maitland A. Edey, *Lucy* (1981)

The Great Rift Valley which I have mentioned above is one of the most striking geographical features of the African continent. It is of very great interest and importance to us in our search for the evidence of early man, for it did not attain its present form until long after man had arrived in Africa.

Louis S.B. Leakey, *Adam's Ancestors* (1935)

Laetoli has shown that bipedalism and tool making were probably quite separate developments in the mosaic of human evolution.

Mary D. Leakey, *Disclosing the Past* (1984)

My study of man's origins had, naturally, often led me to reflect about religion. I feel certain that religious beliefs are related to the dawning of self-awareness in primitive man. God is an inevitable creation of the human intellect where explanations are unavailable. We will never know when the God concept evolved but it was surely there 70,000 years ago when people began to practise burial rituals in the Middle East and Europe. Self-awareness and the ability to reflect on the universe may well be tied to the expansion of the brain seen in the fossil human ancestor, Homo erectus. *Though we can never prove it, if this were so, 'religion' could be a million years old. . . . I myself do not believe in a god who has or had a human form and to whom I owe my existence. I believe it is man who created God in his image and not the other way round; also I see no reason to believe in a life after death.*

Richard E.F. Leakey, *One Life* (1984)

The closer we came, in fact, to an understanding of man as one manifestation of life on a planet in one solar system in one of many galaxies, the more violently we shied away from the attempt to absorb man into a universe of such wide extent.

Margaret Mead, *Continuities in Cultural Evolution* (1964)

The most critical "moment" in the history of humanity occurred when a creature that had never before done so picked up a stone, chipped off a flake or two to form a cutting edge, used it as a tool, and made other tools according to the same pattern from the same materials.

Ashley Montagu, *The Human Revolution* (1965)

The human situation may perhaps best be understood in terms of cosmology. If there is a meaning to human history, it may well be found there. . . . Our cosmological destiny has, I think, been widely misunderstood. As I see it, we are not, as some say, doomed to perish with the sun in about 5 billion years. Nor, in my opinion, are we doomed to await either a later, final universal catastrope in the big crunch of a closed universe, or else a later, final dissolution into a sort of thin, cold soup of an open universe. I think most astronomers fail to allow for the impact of intelligent life on cosmic dynamics 5 or 10 billion years hence. . . . With the last stage being the long-term management of our galaxy to ensure the survival of our seed and culture forever—whatever the bent of the universe.

Raoul Naroll, *The Moral Order* (1983)

Specific evolution is not the whole of cultural evolution. Culture not only produces adaptive sequences of forms, but sequences of higher forms; it has not only undergone phylogenetic development, but over-all progress. In brief, culture has evolved in a general respect as well as a specific one.

Marshall D. Sahlins and Elman R. Service, eds., *Evolution and Culture* (1960)

The only sound to which I have seen gorillas react with immediate flight is the human voice.... They were never observed to use tools.

George B. Schaller, *The Mountain Gorilla* (1963)

More than ever I do think there is something viable about the theory that humans and orang-utans are closely related. And that is because at present—and I must emphasize "at present"—I am not convinced that alternative theories of hominoid relationships are more robust.

Jeffrey H. Schwartz, *The Red Ape* (1987)

As intellectual descendants of Darwin, we are all concerned with the problem of ultimate or evolutionary causes of behavior.

Barbara B. Smuts, *Sex and Friendship in Baboons* (1985)

Physical anthropology, or human paleontology, is a science heavily dependent upon chance discovery. The details of our ancestry remain uncertain, but we know far more about our family tree today than was apparent two decades ago, and as discoveries have extended the recognized time spans of fossil species, our family tree has taken on an increasingly punctuated shape.

Steven M. Stanley, *The New Evolutionary Timetable* (1981)

The thesis which I venture to sustain, within limits, is simply this, that the savage state in some measure represents an early condition of mankind, out of which the higher culture has gradually been developed or evolved, by processes still in regular operation as of old, the result showing that, on the whole, progress has far prevailed over relapse.

Edward Burnett Tylor, *Primitive Culture* (1871)

Evolution may be defined as a temporal sequence of forms: one form grows out of another; culture advances from one stage to another. In this process time is as integral a factor as change of form. The evolutionist process is irreversible and nonrepetitive. Only systems can evolve; a mere aggregation of things without organic unity cannot undergo evolution. Culture may diffuse piecemeal, as we have seen, but only a systematic organization of cultural elements can evolve.

Leslie A. White, *The Evolution of Culture* (1959)

Modern man is anatomically unique.... At a distance a perceptive Martian zoologist would regard the globular head as a most significant clue to human biology.... We have leaped forward in mental evolution in a way that continues to defy self-

analysis. . . . The transition from purely phenomenological to fundamental theory in sociology must await a full, neuronal explanation of the human brain.

Edward O. Wilson, *Sociobiology* (1975)

ON THE *BEAGLE*

Some people hold the world
in their fingertips, and
are part of what they hold.

The *Beagle* set sail
to easy summer—five years on sea
and land the watchful man
from Cambridge put
his fingers on a universe
of cuttlefish, sea-slugs, condors,
the ancient monsters' bones,
megatherium, mastodon: all
fixed forever in immutable forms, creatures
of a benign Intelligence.
It was written.

But the young man put his fingers on
the pulse of rivers, coral reefs,
pampas and mountains,
the flotsam of earthquakes—and
on futures of learning, from
pigeons' plumage, the beaks of finches, bones
of rabbits and ducks—decades
of learning,
dissecting ten thousand
barnacles—pondering:
"If we choose to let
conjecture run wild, then animals—
our fellow brethren in pain,
disease, death, suffering, and famine—
they may partake from our origin
in one common ancestor:
we may be all
netted together."

The *Beagle* labored on: in the winter
of Cape Horn,
twenty-three days of beating
against the icy bluster
came to broken boats
and spoiled collections.
The good ship rode to shelter—
and there on a rocky point
of Tierra del Fuego, naked
in snow, a mother
suckled her child
("whilst the sleet fell and thawed
on her naked bosom, and on the skin
of her naked baby")—there, in a little band,
stood
"man in his primitive wildness,"
ringed by the dark beech forest:
"As they threw their arms wildly
around their heads,
their long hair streaming,
they seemed the troubled spirits
of another world."
There
in the Bay of Good Success,
Charles Darwin, on the foredeck of the *Beagle,*
our future in his freezing fingertips,
stared into the faces
of our past.

Philip Appleman

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HUMAN EVOLUTION

FOREWORD

A life-long preoccupation with the past as geologist, paleontologist, archeologist, or interdisciplinary evolutionist inevitably leads to a heightened sense of time and a realization of the changes that are possible on this planet throughout the ages. No one who has pondered those consequences of time and change can doubt that evolution has occurred or that it is still taking place.

A special excitement overcomes students of the past whenever new discoveries make them aware of evolutionary process and pattern. The slow rush of evolution is awesome. It is difficult, perhaps even dangerous, for an individual to be attunded to this natural process all the time. For this reason, the society of scientists recognizes certain spokesmen who represent its thoughts on evolution. Their writings are read, or put aside for the moment, in step with one's ability to confront fact and accept it.

In the pages that follow, Professor H. James Birx speaks to us. *Human Evolution* presents an unique perspective on topics of evolution by an author who is an educator, scientist, and humanist. This study is indispensable to researchers and students who seek a history of evolutionary science and desire to find their place within this fast-paced, developing field.

Human evolution is a challenging topic as the record has many gaps. Some matters, such as the origin of bipedality, emergence of abstract thought, first use of fire, and development of articulate speech, have left no unequivocal clues or tangible evidence. It is precisely these issues, however, that most concern modern man. Since hominid fossils, stone artifacts, and prehistoric sites (where they exist at all) have little to say about the concerns of the living, it is the lot of anthropologists and other natural historians to supply those missing details.

Evolutionary science relies heavily upon the imaginations of its adherents. A few hard-won facts from the fossil and artifact records, a pollen

diagram, and perhaps a few potassium-argon age determinations accompanied by sediment analyses all become the gist of an important story in the hands of a skilled scientist-*raconteur.* As new data from the field or laboratory are made known, the rewriting of interpretations and, inevitably, new controversies occur. Likewise, our story remains incomplete.

To admit that much of ancient human, hominid, and hominoid behavior is unknowable and that much of evolutionary theory will remain speculative is to accept the importance of evolutionary thought in modern science. It follows that the study of evolutionary thinkers and the development of their unique perspectives is an acceptable endeavor, indeed.

In approaching the present era, human evolution becomes more than changes in gait, speech, brain size, and body form. It is now possible to write in greater detail about primate adaptation to varied physical environments and the development of human culture.

In the final analysis, a synthesis of scientific thought like *Human Evolution* must serve the interests and ambitions of the community that inspired it. This volume is a review of the past accomplishments and a touchstone for future discovery, analysis, and synthesis. Researchers, who invest significant segments of their lives without immediate gratification or recognition from peers, will find solace in the long tradition of evolutionary thinking that is outlined for them by Professor Birx. They will find a place in the scheme of science and scholarship, and be at ease with their fellows. Truly a human feeling!

Dr. R. Michael Gramly
Curator of Anthropology
Buffalo Museum of Science