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PHYSICAL ANTHROPOLOGY

97/98

PHYSICAL ANTHROPOLOGY 97/98

Sixth Edition

Editor

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Pasadena City College

Elvio Angeloni received his B.A. from UCLA in 1963, his M.A. in anthropology from UCLA in 1965, and his M.A. in communication arts from Loyola Marymount University in 1976. He has produced several films, including *Little Warrior,* winner of the Cinemedia VI Best Bicentennial Theme, and *Broken Bottles,* shown on PBS. He most recently served as an academic adviser on the instructional television series, *Faces of Culture.*

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Dushkin/McGraw-Hill
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Cataloging in Publication Data
Main entry under title: Annual editions: Physical anthropology. 1997/98.
1. Physical anthropology—Periodicals. I. Angeloni, Elvio, *comp.*
II. Title: Physical anthropology.
ISBN 0–697–37341–X 573'.05

Sixth Edition

Cover: Thin-boned gracile Australopithecine skull (about 2.5 million years old) found in Sterkfontein, South Africa. Photo by Jay Kelley/Anthro-Photo.

Printed in the United States of America

Printed on Recycled Paper

To the Reader

In publishing ANNUAL EDITIONS we recognize the enormous role played by the magazines, newspapers, and journals of the *public press* in providing current, first-rate educational information in a broad spectrum of interest areas. Many of these articles are appropriate for students, researchers, and professionals seeking accurate, current material to help bridge the gap between principles and theories and the real world. These articles, however, become more useful for study when those of lasting value are carefully *collected, organized, indexed,* and *reproduced* in a *low-cost format,* which provides easy and permanent access when the material is needed. That is the role played by ANNUAL EDITIONS. Under the direction of each volume's *academic editor,* who is an expert in the subject area, and with the guidance of an *Advisory Board,* each year we seek to provide in each ANNUAL EDITION a current, well-balanced, carefully selected collection of the best of the public press for your study and enjoyment. We think that you will find this volume useful, and we hope that you will take a moment to let us know what you think.

This sixth edition of *Annual Editions: Physical Anthropology* contains a variety of articles relating to human evolution. The writings were selected for their timeliness, relevance to issues not easily treated in the standard physical anthropology textbook, and clarity of presentation.

Whereas textbooks tend to reflect the consensus within the field, *Annual Editions: Physical Anthropology 97/98* provides a forum for the controversial. We do this in order to convey to the student the sense that the study of human development is an evolving entity in which each discovery encourages further research, and each added piece of the puzzle raises new questions about the total picture.

Our final criterion for selecting articles is readability. All too often, the excitement of a new discovery or a fresh idea is deadened by the weight of a ponderous presentation. We seek to avoid that by incorporating essays written with enthusiasm and with the desire to communicate some very special ideas to the general public.

Included in this volume are a number of features designed to be useful for students, researchers, and professionals in the field of anthropology. While the articles are arranged along the lines of broadly unifying subject areas, the *topic guide* can be used to establish specific reading assignments tailored to the needs of a particular course of study. Other useful features include the *table of contents* abstracts, which summarize each article and present key concepts in bold italics, and a comprehensive *index*. In addition, each unit is preceded by an overview that provides a background for informed reading of the articles, emphasizes critical issues, and presents *challenge questions*.

In contrast to the usual textbook, which by its nature cannot be easily revised, this book will be continually updated in order to reflect the dynamic, changing character of its subject. Those involved in producing *Annual Editions: Physical Anthropology 97/98* wish to make the next one as useful and effective as possible. Your criticism and advice are welcomed. Please complete and return the postage-paid *article rating form* on the last page of the book and let us know your opinions. Any anthology can be improved, and this one will continue to be.

Elvio Angeloni
(Internet address: evangeloni@paccd.cc.ca.us)

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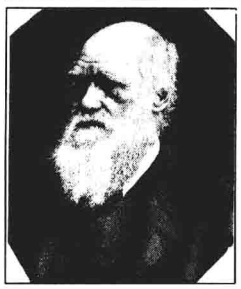
1. **The Growth of Evolutionary Science,** Douglas J. Futuyma, from *Science on Trial,* Pantheon Books, 1982. 6
Before the rise of ***science,*** the causes of orderly events were sought in the ***divine purposes*** they were thought to have served. Today, patterns and designs are seen to be the result of ***natural selection.***
2. **Evolution's New Heretics,** Roger Lewin, *Natural History,* May 1996. 15
Just as some biologists believe that ***natural selection*** operates at the level of individual interest, there are others who are convinced that, when the individual's interest is tied in with that of the group, ***group selection*** takes over.
3. **Keeping Up Down House,** Richard Milner, *Natural History,* August 1996. 19
As a shrine to the great naturalist, Down House, the country estate of Charles Darwin, tells us much about the decades of uninterrupted thought, study, and experimentation that would shape Darwin's ***theory of evolution.***
4. **Curse and Blessing of the Ghetto,** Jared Diamond, *Discover,* March 1991. 21
Tay-Sachs disease is a choosy killer, one that for centuries targeted Eastern European Jews above all others. By decoding its lethal logic, we can learn a great deal about how ***genetic diseases*** evolve—and how they can be conquered.
5. **The Future of AIDS,** Geoffrey Cowley, *Newsweek,* March 22, 1993. 27
Since ***viruses,*** like everything else in nature, evolve by means of ***mutation*** and ***natural selection,*** a Darwinian perspective not only enriches our understanding of ***AIDS,*** but also promises to help us fight it.

UNIT 1



Natural Selection

Seven articles examine the link between genetics and the process of natural selection.

The concepts in bold italics are developed in the article. For further expansion please refer to the Topic Guide and the Index.

6. **Black, White, Other,** Jonathan Marks, *Natural History,* December 1994. 33
With regard to classifying human beings, the central message of anthropology is: you may group humans into a small number of ***races*** if you want to, but you are denied biology as a support for it.

7. **Racial Odyssey,** Boyce Rensberger, *Science Digest,* January/February 1981. 36
In spite of the many attempts over the past 20 years to classify humans into separate and "pure" ***races,*** the consensus among geneticists and anthropologists is that there are overlapping differences among us that are matters of degree rather than of kind.

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8. **Machiavellian Monkeys,** James Shreeve, *Discover,* June 1991. 44
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9. **What Are Friends For?** Barbara Smuts, *Natural History,* February 1987. 48
An understanding of ***friendship bonds*** among baboons is not only destroying our stereotypes about monkeys in the wild, but it is also calling into question traditional views concerning the ***relationships*** between the ***sexes*** in early hominid evolution.

10. **Gut Thinking,** Peter Radetsky, *Discover,* May 1995. 54
Diet is a driving force in primate evolution. It has so much to do with how we think, how we organize our ***social lives,*** and how we raise our young, that we truly are what we eat.

11. **The Mind of the Chimpanzee,** Jane Goodall, from *Through a Window,* Houghton Mifflin, 1990. 58
It has long been recognized that the differences in anatomy and physiology between apes and humans are a matter of degree. Because of the work of Jane Goodall, we have come to realize that there is continuity in ***mental*** and ***emotional development*** as well.

12. **Dian Fossey and Digit,** Sy Montgomery, from *Walking with the Great Apes,* Houghton Mifflin, 1991. 63
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13. **These Are Real Swinging Primates,** Shannon Brownlee, *Discover,* April 1987. 72
Although the muriqui monkeys of Brazil are heavily invested in ***reproductive competition,*** they seem to get along just fine without a ***dominance hierarchy*** and fighting over females. In other words, their mission in life seems geared to making love, not war.

14. **Natural-Born Mothers,** Sarah Blaffer Hrdy, *Natural History,* December 1995. 78
Faced with poor living conditions, a mother must weigh her baby's chances of survival against her own well-being, long-term survival and—most important—the possibility of breeding again under better circumstances. Behavioral ecologists are only beginning to understand how ***mammalian mothers*** respond to such a dilemma, called ***"fitness trade-off."***

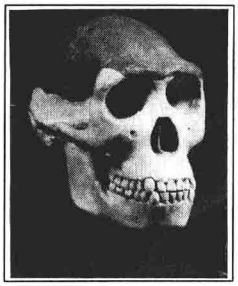
15. **Sex and the Female Agenda,** Jared Diamond, *Discover,* September 1993. 86
The confusing variety of primate ***mating patterns*** associated with ***concealed ovulation*** has long befuddled anthropologists. Now, it seems, concealed ovulation may not serve just one purpose, but, rather, it may have different functions for different primates.

16. **Why Women Change,** Jared Diamond, *Discover,* July 1996. 91
The winners of evolution's race are those who leave behind the most offspring to carry on their progenitors' genes. So, asks Jared Diamond, doesn't it seem odd that human females should experience ***menopause***?

17. **What's Love Got to Do with It?** Meredith F. Small, *Discover,* June 1992. 96
The ***bonobos'*** use of sex to reduce tension and to form ***alliances*** is raising some interesting questions regarding human evolution. Does this behavior help to explain the origins of our ***sexuality,*** or should we see it as just another primate aberration that occurred after humans and primates split from their common lineage?

18. **Apes of Wrath,** Barbara Smuts, *Discover,* August 1995. 100
Whether or not males beat up females in a particular species seems to have a great deal to do with who is forming ***alliances*** with whom. This, in turn, has powerful implications as to what can be done about ***sexual coercion*** in the human species.

UNIT 4



The Hominid Transition

Four articles examine the enigma of human evolution from the ape. A definitive common fossil link between apes and humans has yet to be made.

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19. **Dim Forest, Bright Chimps,** Christophe Boesch and Hedwige Boesch-Achermann, *Natural History,* September 1991. 106
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20. **To Catch a Colobus,** Craig B. Stanford, *Natural History,* January 1995. 110
When ***chimpanzees*** in Gombe National Park band together to ***hunt*** red colobus monkeys, the most important ingredient seems to be the number of males and the presence of at least one estrous female. Their goals appear to be more ***social*** than dietary.

21. **Ape at the Brink,** Sue Savage-Rumbaugh and Roger Lewin, *Discover,* September 1994. 113
A bonobo like Kanzi may not be able to match the skills of an ***Oldowan toolmaker,*** but what he learns and how he learns it may help us to better understand the ancient art of ***flint knapping.***

22. **Ape Cultures and Missing Links,** Richard W. Wrangham, *Symbols,* Spring 1995. 120
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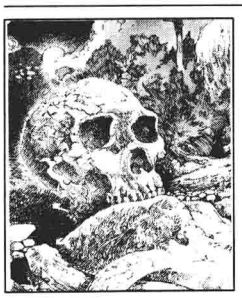

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Six selections discuss some of the fossil evidence for hominid evolution.

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23. **Dawson's Dawn Man: The Hoax at Piltdown,** Kenneth L. Feder, from *Frauds, Myths, and Mysteries,* Mayfield Publishing Company, 1990. 130
The unveiling of one of the greatest ***hoaxes*** of the twentieth century is an object lesson in how ***science*** really works—as a self-correcting process, ultimately defeating trickery and personal bias.

24. **The Case of the Missing Link,** Robert B. Anderson, *Pacific Discovery,* Spring 1996. 138
Despite circumstantial evidence pointing to many different suspects, the identity of the ***Piltdown hoaxer*** has remained a great mystery. Now, according to Robert Anderson, a confession has finally come to light.

25. **Sunset on the Savanna,** James Shreeve, *Discover,* July 1996. 147
The long-held belief that ***hominid bipedalism*** owes its origin to a shift from life in the forest to life in a more open habitat is being challenged by new evidence regarding fossils found in the wrong place at the wrong time.

26. **East Side Story: The Origin of Humankind,** Yves Coppens, *Scientific American,* May 1994. 153
Climate change in the ***Rift Valley*** of East Africa seems to have prompted the divergence of ***hominids*** from the great apes and, then, the emergence of ***human beings.***

27. **Asian Hominids Grow Older,** Elizabeth Culotta, *and* **Do Kenya Tools Root Birth of Modern Thought in Africa?** JoAnn Gutin, *Science,* November 17, 1995. 162
Several recently discovered ***fossils*** in China and Chad and ***pointed stones*** in Kenya could "alter the picture of ***human dispersal and evolution.***" These and other findings challenge the textbooks.

28. **Scavenger Hunt,** Pat Shipman, *Natural History,* April 1984. 166
Microscopic analyses of tooth wear and cut marks on bone, combined with an increased understanding of the advantages of ***bipedalism,*** point in the direction of a "man the ***scavenger***" model rather than "man the ***hunter.***"

UNIT 6

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30. **The First Europeans,** Jean-Jacques Hublin, *Archaeology,* January/February 1996. 178
Jean-Jacques Hublin examines recent discoveries that demonstrate that ***Neandertals' ancestors*** occupied Europe for hundreds of thousands of years, evolving from ***archaic Homo sapiens*** as they became isolated from the mother population in Africa and the Near East.

31. **Did Neandertals Lose an Evolutionary "Arms" Race?** Ann Gibbons, *Science,* June 14, 1996. 184
Ann Gibbons reveals some of the differences that might have given the evolutionary edge to ***modern humans*** over Neandertals. Better food procurement and more elaborate social systems are key factors.

32. **The Dawn of Creativity,** *U.S. News & World Report,* May 20, 1996. 186
This essay suggests that early human ***tools*** and ***cave paintings*** can tell us a great deal about the changing fabric of ***human society.***

33. **Old Masters,** Pat Shipman, *Discover,* July 1990. 189
Systematic analyses of the ***cave paintings*** in Europe reveal Cro-Magnons' intimate knowledge of the animals that were hunted and, perhaps, even purposeful ***rituals*** associated with the images.

34. **The Dating Game,** James Shreeve, *Discover,* September 1992. 193
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35. **The Neanderthal Peace,** James Shreeve, *Discover,* September 1995. 198
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UNIT 7

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36. **Profile of an Anthropologist: No Bone Unturned,** Patrick Huyghe, *Discover,* December 1988. 208
The skills displayed by ***physical anthropologists*** and ***archeologists*** in the analysis of old bones have resulted in the development of a whole new field: ***forensic anthropology.***

37. **Eugenics Revisited,** John Horgan, *Scientific American,* June 1993. 213
Scientists are linking ***genes*** to a host of complex ***human disorders*** and ***traits.*** But just how valid is this new field of ***behavioral genetics,*** and does it portend some form of ***eugenics***?

38. **The DNA Wars,** Edward Humes, *Los Angeles Times Magazine,* November 29, 1992. 221
Once touted as an infallible method of convicting the guilty and exonerating the innocent, ***DNA matching*** has mired the courts in a vicious battle of expert witnesses.

39. **The Saltshaker's Curse,** Jared Diamond, *Natural History,* October 1991. 228
Physiological adaptations that at one time helped West Africans and their descendants cope with unusually high ***salt loss*** may now be predisposing African Americans to ***hypertension*** and a premature ***death.***

40. **Dr. Darwin,** Lori Oliwenstein, *Discover,* October 1995. 233
The application of ***Darwin's theory of evolution*** to the understanding of ***human diseases*** will not only help us better treat the symptoms of diseases, but also promises to help us understand how microbes and humans have evolved in relation to one another.

41. **The Future Evolution of *Homo Sapiens,*** Colin Tudge, *Earth,* February 1996. 237
While speculating about what the ***future*** may hold for ***our species,*** an eminent biologist sees an obstacle race, with some potentials realized and some opportunities lost. None of this, of course, is at present knowable and predictable.

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The concepts in bold italics are developed in the article. For further expansion please refer to the Topic Guide and the Index.

Editors/Advisory Board

Members of the Advisory Board are instrumental in the final selection of articles for each edition of ANNUAL EDITIONS. Their review of articles for content, level, currentness, and appropriateness provides critical direction to the editor and staff. We think that you will find their careful consideration well reflected in this volume.

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Topic Guide

This topic guide suggests how the selections in this book relate to topics of traditional concern to students and professionals involved with the study of physical anthropology. It is useful for locating articles that relate to each other for reading and research. The guide is arranged alphabetically according to topic. Articles may, of course, treat topics that do not appear in the topic guide. In turn, entries in the topic guide do not necessarily constitute a comprehensive listing of all the contents of each selection.

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Natural Selection

As the twentieth century draws to a close and we reflect upon where science has taken us over the past 100 years, it should come as no surprise that the field of genetics has swept us along a path of insight into the human condition as well as heightened controversy as to how to handle this potentially dangerous knowledge of ourselves.

Certainly, Gregor Mendel in the late nineteenth century could not have anticipated that his study of pea plants would ultimately lead to the better understanding of over 3,000 genetically caused diseases, such as sickle-cell anemia, Huntington's chorea, and Tay-Sachs. Nor could he have foreseen the present-day controversies over such matters as surrogate motherhood, cloning, and genetic engineering.

The significance of Mendel's work, of course, was his discovery that hereditary traits are conferred by particular units that we now call "genes," a then-revolutionary notion that has been followed by a better understanding of how and why such units change. It is knowledge of the process of "mutation," or alteration of the chemical structure of the gene, that is now providing us with the potential to control the genetic fate of individuals.

The other side of the evolutionary coin, as discussed in the unit's first and third articles, "The Growth of Evolutionary Science" and "Keeping Up Down House," is natural selection, a concept provided by Charles Darwin and Alfred Wallace. Natural selection refers to the "weeding out" of unfavorable mutations and the perpetuation of favorable ones. The pace and manner in which such forces become evident in the fossil record has been the subject of a great deal of discussion among scientists (see Roger Lewin's essay "Evolution's New Heretics") and, indeed, of some controversy among nonscientists.

It seems that as we gain a better understanding of both of these processes, mutation and natural selection, and grasp their relevance to human beings (as described by Jonathan Marks in his article, "Black, White, Other," and by Boyce Rensberger in "Racial Odyssey"), we draw nearer to that time when we may even control the evolutionary direction of our species. Knowledge itself, of course, is neutral—its potential for good or ill being determined by those who happen to be in a position to use it. Consider the possibility of eliminating some of the harmful hereditary traits discussed in "Curse and Blessing of the Ghetto" by Jared Diamond. While it is true that many deleterious genes do get weeded out of the population by means of natural selection, there are other harmful ones, Diamond points out, that may actually have a good side to them and will therefore be perpetuated. It may be, for example, that some men are dying from a genetically caused overabundance of iron in their blood systems in a trade-off that allows some women to absorb sufficient amounts of the element to guarantee their own survival. The question of whether or not we should eliminate such a gene would seem to depend on which sex we decide should reap the benefit.

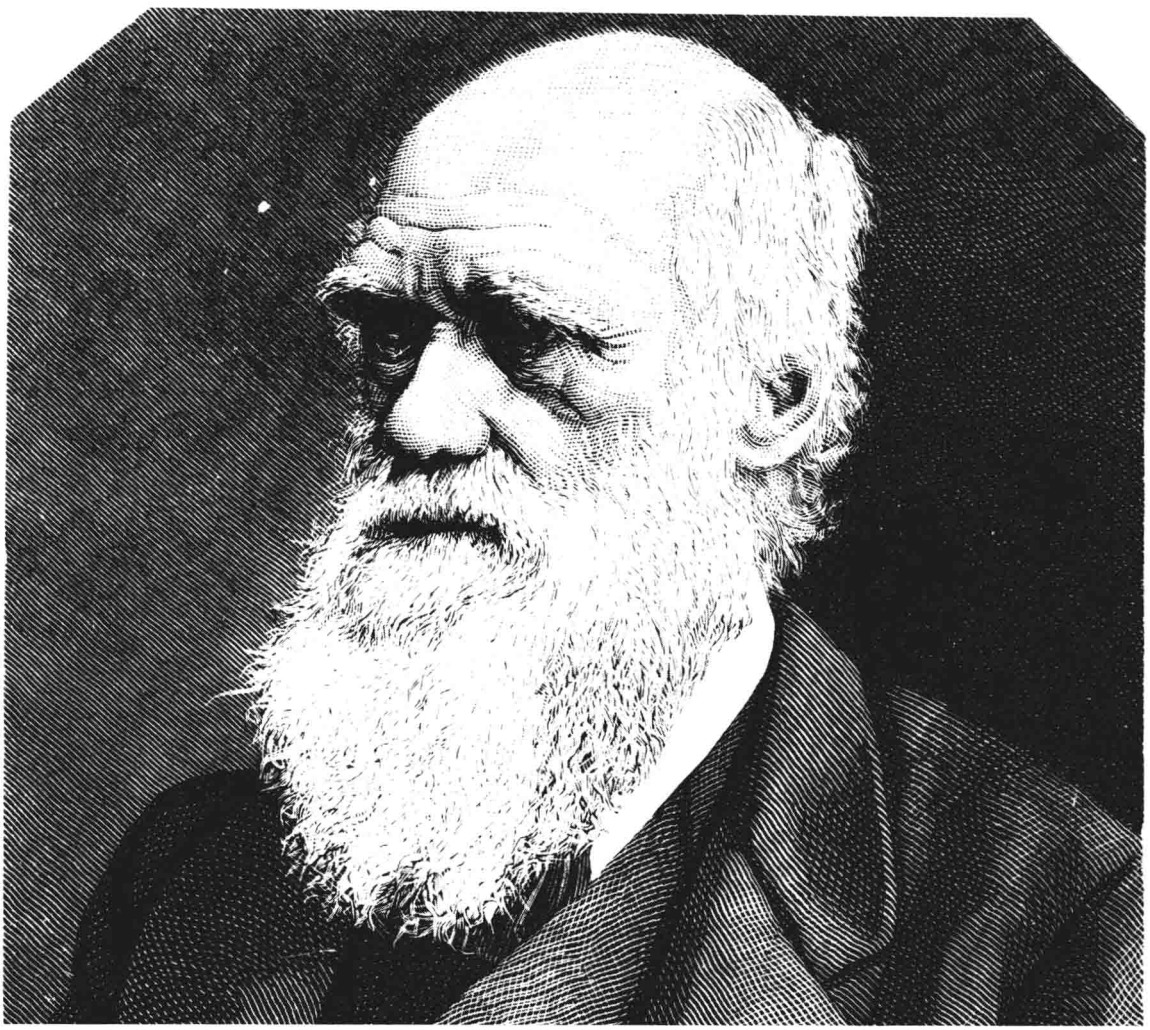
The issue of just what is a beneficial application of scientific knowledge is a matter for debate. Who will have the final word as to how these technological breakthroughs will be employed in the future? Even with the best of intentions, how can we be certain of the long-range consequences of our actions in such a complicated field? Note, for example, the sweeping effects of ecological change upon the viruses of the world, which in turn seem to be paving the way for new waves of human epidemics. Generally speaking, there is an element of purpose and design in our machinations. Yet, even with this clearly in mind, the whole process seems to be escalating out of human control. As Geoffrey Cowley points out in "The Future of AIDS," it seems that the whole world has become an experimental laboratory in which we know not what we do until we have already done it.

As we read the essays in this unit and contemplate the significance of genetic diseases for human evolution, we can hope that a better understanding of congenital diseases will lead to a reduction of human suffering. At the same time, we must remain aware that, rather than reduce the misery that exists in the world, someone, at some time, may actually use the same knowledge to increase it.

Looking Ahead: Challenge Questions

In nature, how is it that design can occur without a designer, orderliness without purpose?

UNIT 1



Charles Darwin

What is "natural selection"? Does it operate upon groups within a species or solely upon individuals?

How and why might the ABO blood group be related to epidemic diseases?

Discuss whether or not people should be told that they are going to die of a disease from which they are presently suffering and for which there is no cure.

How is it possible to test for deleterious genes?

Why is Tay-Sachs disease so common among Eastern European Jews?

How do ecological changes cause new viruses to emerge?

What do you predict for the future of the AIDS epidemic?

Discuss whether or not the human species can be subdivided into racial categories. How and why did the concept of race develop?

The Growth of Evolutionary Science

Douglas J. Futuyma

Today, the theory of evolution is an accepted fact for everyone but a fundamentalist minority, whose objections are based not on reasoning but on doctrinaire adherence to religious principles.
—James D. Watson, 1965*

In 1615, Galileo was summoned before the Inquisition in Rome. The guardians of the faith had found that his "proposition that the sun is the center [of the solar system] and does not revolve about the earth is foolish, absurd, false in theology, and heretical, because expressly contrary to Holy Scripture." In the next century, John Wesley declared that "before the sin of Adam there were no agitations within the bowels of the earth, no violent convulsions, no concussions of the earth, no earthquakes, but all was unmoved as the pillars of heaven." Until the seventeenth century, fossils were interpreted as "stones of a peculiar sort, hidden by the Author of Nature for his own pleasure." Later they were seen as remnants of the Biblical deluge. In the middle of the eighteenth century, the great French naturalist Buffon speculated on the possibility of cosmic and organic evolution and was forced by the clergy to recant: "I abandon everything in my book respecting the formation of the earth, and generally all of which may be contrary to the narrative of Moses." For had not St. Augustine written, "Nothing is to be accepted save on the authority of Scripture, since greater is that authority than all the powers of the human mind"?

When Darwin published *The Origin of Species,* it was predictably met by a chorus of theological protest. Darwin's theory, said Bishop Wilberforce, "contradicts the revealed relations of creation to its Creator." "If the Darwinian theory is true," wrote another clergyman, "Genesis is a lie, the whole framework of the book of life falls to pieces, and the revelation of God to man, as we Christians know it, is a delusion and a snare." When *The Descent of Man* appeared, Pope Pius IX was moved to write that Darwinism is "a system which is so repugnant at once to history, to the tradition of all peoples, to exact science, to observed facts, and even to Reason herself, [that it] would seem to need no refutation, did not alienation from God and the leaning toward materialism, due to depravity, eagerly seek a support in all this tissue of fables."[1] Twentieth-century creationism continues this battle of medieval theology against science.

One of the most pervasive concepts in medieval and post-medieval thought was the "great chain of being," or *scala naturae.*[2] Minerals, plants, and animals, according to his concept, formed a gradation, from the lowliest and most material to the most complex and spiritual, ending in man, who links the animal series to the world of intelligence and spirit. This "scale of nature" was the manifestation of God's infinite benevolence. In his goodness, he had conferred existence on all beings of which he could conceive, and so created a complete chain of being, in which there were no gaps. All his creatures must have been created at once, and none could ever cease to exist, for then the perfection of his divine plan would have been violated. Alexander Pope expressed the concept best:

Vast chain of being! which from God began,
Natures aethereal, human, angel, man,
Beast, bird, fish, insect, what no eye can see,
No glass can reach; from Infinite to thee,
From thee to nothing.—On superior pow'rs
Were we to press, inferior might on ours;
Or in the full creation leave a void,
Where, one step broken, the great scale's destroy'd;
From Nature's chain whatever link you strike,
Tenth, or ten thousandth, breaks the chain alike.

Coexisting with this notion that all of which God could conceive existed so as to complete his creation was the idea that all things existed for man. As the philosopher Francis Bacon put it, "Man, if we look to final causes, may be regarded as the centre of the world . . . for the whole world works together in the service of man . . . all things seem to be going about man's business and not their own."

"Final causes" was another funda-

*James D. Watson, a molecular biologist, shared the Nobel Prize for his work in discovering the structure of DNA.

From *Science of Trial* by Douglas J. Futuyma, pp. 23-43. Published by Pantheon Books, a division of Random House, Inc.