PHYSICAL ANTHROPOLOGY

SEVENTH EDITION

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CONTENTS IN BRIEF

To our families and in memory of
Eleanor Frances Blumenthal Rowe Michael
Barbara Stein Akerman
Arnold L. Freed, M.D.

PREFACE

In the history of science, each decade and each century can be characterized by landmark developments. In the realm of biology, the nineteenth century was the time during which the first valid explanations of biological evolution were published and debated. The twentieth century can be characterized as a time of meteoric insight into genetic processes.

If we dare to predict, we would characterize the twenty-first century as the era during which humans will gain the ability to manipulate their own genes. Society will be able to design more biological changes for the human species in a few decades than the natural processes of evolution did over tens of thousands of years. Of course, science fiction writers have dealt with this topic for most of the twentieth century. Most of these treatments, such as Aldous Huxley's *Brave New World* (1932), see human interference with our "natural" biological nature as disastrous. Yet others see the control of human genetics as the next step in the long evolution of hominids from small-brained primates to organisms capable, through our changing technology, of influencing their own evolution.

This book traces our present understanding of human biological evolution, the main theme of the field of physical anthropology. Chapter 1 outlines the history and development of ideas in the area of human biological evolution. Chapters 2 through 4

explore our knowledge of genetics and the importance of this knowledge as a basis for the understanding of evolutionary processes. Chapter 5 examines in detail Charles Darwin's main contribution to the understanding of evolution, his concept of natural selection. Chapters 6 through 10 place humans, both physically and behaviorally, in the context of the rest of the animal kingdom. In doing this, we emphasize the relationship of humans to their closest relatives, the living primates. Chapters 11 to 15 outline the evolutionary history of the primate order with emphasis on human evolution. Chapters 16 and 17 describe aspects of the biology of modern human populations, including exploration of the reasons why people vary physically from one another.

This text incorporates a number of pedagogical devices that will aid the reader in understanding and learning the information contained within. Each chapter is divided by headings into manageable segments, and the three levels of headings can assist the student in outlining the material. A summary is found at the end of each major section. All technical terms are in boldface type at their first appearance, and their definitions can be found in the Glossary. There is also a second Glossary that lists and identifies major taxonomic groups among the living and fossil primates. Suggested Readings, Study Questions, and Suggested Web Sites are found at the end of each chapter.

This text is also accompanied by four supplements, one for the student, two for the instructor, and one for both. For the student, Rebecca Stein has written a completely new and exciting *Workbook* with original art by Erik Even. Each chapter includes exercises illustrating or expanding on ideas presented in the text, a directory of over 200 relevant web sites, activities (including Internet-based activities), and exercises. The activities include suggestions for student projects that involve work outside class, such as research paper topics or experiments. Exercises involve working through problem sets related to concepts from the text. Each exercise includes a short introduction that serves to emphasize and review material presented in the text.

The *Workbook* also includes a CD developed by Rebecca Stein, Erik Even, and Robert Frankle. The CD provides chapter summaries with links to appropriate Internet sites and to the searchable Glossary, many activities and exercises, important terms, as well as computer-graded quizzes.

Physical anthropology is a rapidly changing field. For the instructor and student, McGraw-Hill publishes the authors' *Physical Anthropology Update.* Instructors may order complementary copies through their McGraw-Hill representative; everyone can read the updates on the Internet at http://www.mhhe.com/socscience/anthropology/newsletters.mhtml.

For the instructor, the *Instructor's Manual* provides over 1000 exam questions, also available as exam-writing software. For this seventh edition, we welcome Rebecca Stein, who has revised the *Instructor's Manual* and added a great many new exam questions. The manual also includes lists of films, videos, and software, along with suppliers, and sources of supplies and equipment. Transparencies of many illustrations are also available.

McGraw-Hill and the authors would like to thank many reviewers for their helpful comments and suggestions. The names of the reviewers are listed in the acknowledgments.

Finally, special appreciation goes to our families—especially Carol Stein and Christine L. Rowe—for their encouragement and help, and the representative of the second generation, Rebecca Stein, for taking on the task of the *Instructor's Manual* and *Workbook.*

Philip L. Stein
Bruce M. Rowe

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CONTENTS

CHAPTER 1

Investigating the Nature of Humankind

We have now seen that man is variable in body and mind; and that the variations are induced, either directly or indirectly, by the same general causes, and obey the same general laws, as with the lower animals. Man has spread widely over the face of the earth, and must have been exposed, during his incessant migrations, to the most diversified conditions.[1]

—Charles Darwin

Chapter Outline

[1]C. Darwin, *The Descent of Man*, 2nd rev. ed. (London: J. Murray, 1874), p. 47.

The ideas embodied in the opening quotation, taken from *The Descent of Man,* were revolutionary for their time. Darwin's message was that humans, like all animals, were not specially created and that human characteristics arise from the actions of the same natural forces that affect all life.

Darwin is thought to have been a great discoverer of new facts and ideas, and indeed he was. On the other hand, Darwin's ideas, like all ideas, were formed, nurtured, and brought to maturity in the context of particular intellectual backgrounds. The things we think, the relationships we see, and the very process of creativity are determined, in part, by our cultural environment. The knowledge that a person has at any one time represents the accumulation of information and ideas from his or her whole lifetime. The theory of evolution was not developed by one person. It was part of a chain of intellectual events, each link being necessary to the continuity of that chain.

THE WORLD OF PHYSICAL ANTHROPOLOGY

The anthropologist is an explorer in pursuit of answers to such questions as: What is it to be human? How did humans evolve? What is the nature of humankind? Anthropology is such a broad discipline, however, that it is divided into several subfields or branches. One of the oldest subfields is that of **physical anthropology,** the study of human biological evolution, which is the process of biological change by which populations of organisms come to differ from their ancestral populations.

Studies of Physical Anthropology

Physical anthropology is a very diverse field. Some areas of interest lie within the realm of biology and medical science; others are more tuned to cultural anthropology and archaeology.[2]

Anthropologists who specialize in the study of growth and development and anatomy are often found in departments of anatomy, health sciences, and schools of medicine. These investigators frequently conduct research on human populations in various parts of the world, allowing them to compare different modern populations. For example, physical anthropologists might study the growth patterns of children growing up at high altitude in the Peruvian Andes Mountains. Many anthropologists who specialize in anatomy have a special interest in the skeleton and dentition. Other anthropologists study a wide range of health-related topics such as nutrition, disease, and aging.

A focal area of study in physical anthropology is the study of evolution. Anthropologists join with their colleagues in biology in the study of evolutionary theory. Anthropologists are particularly interested in the reconstruction of human and nonhuman primate evolution. Key evidence in these studies is the evidence provided through the fossil record (paleontology) and through analysis of cultural remains (archaeology). Paleontology and archaeology join to create the study of paleoanthropology. More recently, the comparative study of protein molecules and DNA, the heredity material, has created the field of molecular evolution, which has brought forth new understandings about the relationships among contemporary organisms.

As we will see later, the critical unit of evolution is the population, a group of closely related organisms. Anthropologists carefully document the characteristics of extant human populations in a number of ways. From these studies, we can learn about how different human populations adapt to their environments. The study of human variation is especially important in our shrinking world as more and more people from diverse parts of the world become economically and politically influenced by one another.

Many physical anthropologists specialize in the study of the fossil record or in skeletal remains found in an archaeological context. For these reasons, anthropologists have become very interested in the biology of the skeleton. As a result, some anthropologists are employed in forensic anthropology, a branch of forensic science. Often found in coroner offices, forensic anthropologists analyze skeletal remains from criminal scenes to determine biological factors about the individual, such as sex and age at death, as well as to determine the probable cause of death.

The members of the animal kingdom most closely related to humans in an evolutionary sense

[2]For further information about the diversity of disciplines within physical anthropology, see C. W. Wienker and K. A. Bennett, "Trends and Developments in Physical Anthropology," *American Journal of Physical Anthropology* 87 (1992), pp. 383–393.