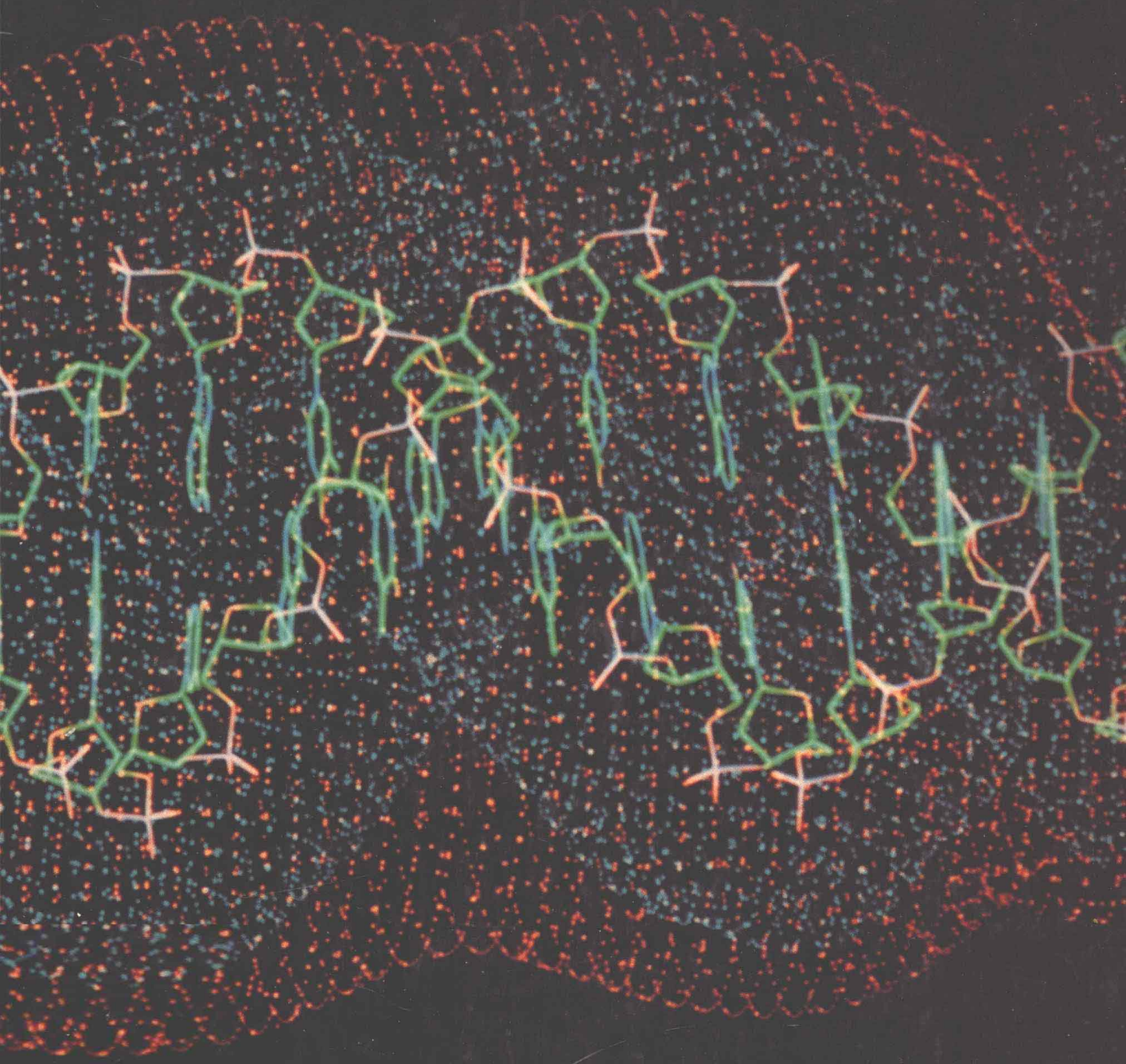
Fundamentals of Biological Anthropology



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Preface

This text is an abridged and slightly rewritten version of the second edition of my text *The Human Species: An Introduction to Biological Anthropology.* Why a brief version of a textbook? No single textbook can accommodate perfectly all the different ways in which an introductory course in biological/physical anthropology is taught. Instructors vary in terms of their interests, use of supplemental readings, and allotted time for their courses. This text will serve several audiences for which the larger version might not be appropriate. First, a shorter text is more useful for those teaching on a quarter system, or a summer session, as opposed to a 15-week semester. Second, some instructors like having supplemental readings, and a shorter text suits this arrangement. Third, some instructors like texts with less detail than traditional introductory books—this text fills this need. Fourth, the shorter length of the book makes it more useful in general anthropology or archaeology/physical anthropology courses. Fifth, some instructors may prefer a slightly different organizational structure. This text differs slightly in organization from the larger edition by including the material on human biology and culture in a single chapter placed with other chapters on human variation.

Organization

As its title indicates, *Fundamentals of Biological Anthropology* provides a basic introduction to the field of biological anthropology (also known as physical anthropology), which deals with the biological aspects of human origins, evolution, and variation. As such, biological anthropology is an evolutionary science. Though biological anthropology focuses on the *biological* aspects of the human species, it also deals extensively with the *cultural* dimensions of humanity, emphasizing the interrelationship between biology and culture.

The first three chapters of the book provide some essential evolutionary background. Chapter 1 introduces the field of anthropology in general, and biological anthropology specifically, and also looks at the nature of evolutionary theory. Chapter 2 covers the basic principles of human genetics. Chapter 3, which examines evolutionary theory in more detail,

discusses microevolution (population genetics) and macroevolution (especially the origin of species).

The next three chapters explore the nature of human biological variation. Chapter 4 furnishes case studies of human microevolution, particularly gene flow, genetic drift, and natural selection. Chapter 5 contrasts the microevolutionary approach to human variation with the dated, but still popular, racial approach to variation, using skin color and IQ test scores as examples. The importance of the relationship of human biology and culture is emphasized in Chapter 6, which presents brief reviews and case studies from the fields of human growth, human adaptation, human health and disease (biomedical anthropology), and demography.

In comparing humans to other living creatures, the next two chapters focus on variation in a wider perspective. Chapter 7 examines the taxonomy and behavior of mammals and primates, with particular emphasis on comparison with humans. Chapter 8 focuses on apes and humans, specifically on their biological and behavioral similarities and differences.

The final three chapters deal with the fossil record of human evolution. Chapter 9 reviews some basic methods of paleontology, surveys the history of life prior to the emergence of primates, and concludes with evidence and discussion of the origin and evolution of the primates. Chapter 10 deals with the first hominids—*Australopithecus* and *Homo habilis*—and explains major evolutionary trends. Chapter 11, which concludes the review of human evolution, examines the evolution of *Homo erectus,* archaic *Homo sapiens,* and anatomically modern *Homo sapiens.*

Features

• *All areas of contemporary biological anthropology are covered.* Many traditional texts in this field cover the basics of evolution and genetics, primate studies, the fossil record for human evolution, and selected studies of human variation. This text provides a more balanced treatment of the field of biological anthropology, including material on subjects often neglected. Topics of special concern are human growth, health and disease, and demography.

• *The relationship of human biology and culture is a major focus.* The biocultural framework is introduced in the first chapter and integrated throughout the text. Chapter 6 is entirely devoted to biocultural issues—growth, adaptation, health and disease, and demography—that are often omitted from many introductory texts.

• *A review of cell biology occurs early in the text.* For many, the basic genetics they learned in a high school biology class is but a dim memory. To help underprepared students better understand the basics, I include this review at the end of Chapter 2. Full-color illustrations depict the processes of mitosis and meiosis clearly and vividly.

• *Behavior is discussed in an evolutionary context.* I have not devoted separate chapters to primate behavior or the archaeology of early humans because I believe that such material must be covered along with biological evolution. Thus, I include discussions that integrate biology and behavior, including those on genetics and IQ (Chapter 2); inbreeding (Chapter 3); migration, marriage systems, and social structure (Chapter 4), race and intelligence (Chapter 5); culture change and human biology (Chapter 6); primate behavior (Chapters 7 and 8); and the behavior of early humans (Chapters 10 and 11).

• *Hypothesis testing is emphasized.* From the first chapter, where the students are introduced to the scientific method, I emphasize *how* various hypotheses are tested. Rather than provide a dogmatic approach with all the "right" answers, this text examines evidence about human variation and evolution in the context of hypothesis testing.

Study Helps

To make this text more accessible, I have kept technical jargon to a minimum; yet every introductory text contains a number of specialized terms that students must learn. The first mention of these terms appears in **boldface** type, and accompanying short definitions appear in the text margins. A glossary is provided at the end of the book, often providing more detailed definitions.

Each chapter ends with a summary and a list of supplemental readings. The summaries put each chapter's material in more general terms and help students relate the content to other chapters. The supplemental readings are included for those who wish to look further into a given topic, either for clarification or to satisfy an awakened curiosity. A list of references appears at the end of the book, providing the complete reference for studies cited in the text.

Ancillaries

The *Instructor's Manual* includes a test bank as well as chapter overviews and outlines, topics for class discussions, and sources for laboratory equipment.

A *Computerized Test Bank* is available free of charge to qualifying adopters. It is a powerful, easy-to-use test generation system that provides all test items on computer disk for IBM-compatible and Macintosh computers. Instructors can select, add, or edit questions, randomize them, and print tests appropriate for their individual classes. The system also includes a convenient "gradebook" that enables the instructor to keep detailed performance records for individual students and for the entire class; maintain student averages; graph each student's progress; and set the desired grade distribution, maximum score, and weight for every test.

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I also thank my colleagues who reviewed part or all of the second edition of *The Human Species,* and whose ideas I have tried to carry over into this abridged version: Helen L. Ball, University of Massachusetts; Douglas E. Crews, Ohio State University; Janis Hutchinson, University of Houston; Lyle Konigsberg, University of Tennessee; Paul Sciulli, Ohio State University; Mark Stoneking, Pennsylvania State University; Alan Swedlund, University of Massachusetts; Jane Underwood, University of Arizona; and Dennis van Gerven, University of Colorado. Having been a reviewer myself, I appreciate the extensive time and effort these individuals have taken.

This one's dedicated to my in-laws, George and Terry Adler, and, as always, to my wife Hollie Jaffe and my beautiful boys—David, Benjamin, and Zane.

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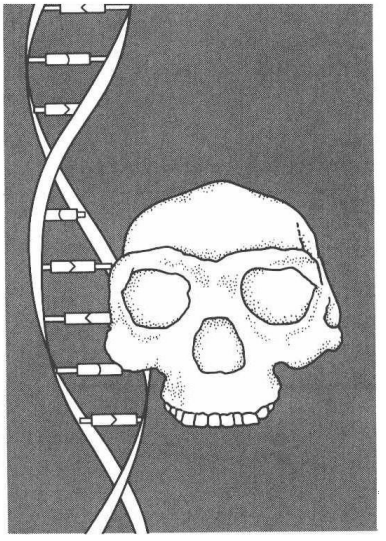


CHAPTER 1

The Study of Biological Anthropology

What is anthropology? To many people, it is the study of the exotic extremes of human nature. To others, it is the study of ancient ruins and lost civilizations. The study of anthropology seems strange to many, and the practitioners of this field, the anthropologists, seem even stranger. The stereotype of an anthropologist is a pith-helmeted, pipe-smoking eccentric tracking chimpanzees through the forest, digging up the bones of million-year-old ancestors, interviewing lost tribes about their sexual customs, and recording the words of the last speakers of a language. Another popular image presented in the media is Indiana Jones, the intrepid archaeologist of the film *Raiders of the Lost Ark*. Here is a man who is versed in the customs and languages of many societies past and present, feels at home anywhere in the world, and makes a living teaching, finding lost treasures, rescuing beautiful women in distress, and fighting Nazis (Figure 1.1).

Of course, Indiana Jones is a fictional character. Some real-life anthropologists are almost as well known, such as Jane Goodall, Margaret Mead, Donald Johanson, and the late Dian Fossey. These anthropologists have studied chimpanzees, Samoan culture, the fossils of human ancestors, and gorillas. Their research conjures up images of anthropology every bit as varied as the imaginary adventures of Indiana Jones. Anthropologists do study all these things, and more. The sheer diversity of topics investigated by anthropologists seems almost to defy any sort of logic. The methods of data collection and analysis are almost as diverse. What pulls these different subjects together?

anthropology The science that investigates human biological and cultural variation and evolution.

culture Behavior that is learned and socially transmitted.

In one obvious sense, they all share an interest in the same subject—human beings. In fact, the traditional textbook definition of anthropology is the "study of humans." Though this definition is easy to remember, it is not terribly useful. After all, scientists in other fields, such as researchers in anatomy and biochemistry, also study humans. And there are many fields within the social sciences whose sole interest is humans. History, geography, political science, economics, sociology, and psychology are all devoted to the study of human beings, and no one would argue that these fields are merely branches of anthropology.

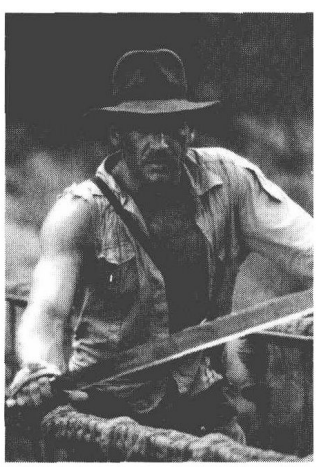
What Is Anthropology?

What, then, is a suitable definition of anthropology? **Anthropology** could be described as the science of human cultural and biological variation and evolution. The first part of this definition includes both human culture and biology. **Culture** is learned behavior. Culture includes social and economic systems, marriage customs, religion, philosophy, and all other behaviors that are acquired through the process of learning rather than being instinctual. The joint emphasis on culture and biology is an important feature of anthropology, and one that sets it apart from many other fields.

Biology and Culture

Figure 1.1

Indiana Jones, the fictional archaeologist who serves as many people's model for an anthropologist. (Eva Sereny, © Lucasfilm Ltd. [LFL] 1984. All Rights Reserved)



To the anthropologist, humans must be understood in terms of learned behavior as well as biology. We rely extensively on learned behaviors in virtually all aspects of our life. Even the expression of our sexual drives must be understood in light of human cultural systems. Although the actual basis of our sex drive is biological, the ways in which we express it are shaped by behaviors we have learned. The very inventiveness of humans, with our vast technology, is testimony to the powerful effect of learning. On the other hand, however, we are not purely cultural creatures. We are also biological organisms. We need to eat and breathe, and we are affected by our external environment. In addition, our biology sets certain limits on our potential behaviors. For example, all human cultures have some type of social structure that provides for the care of children until they are old enough to fend for themselves. This is not simply kindness to children; our biological position as mammals requires such attentiveness to children for survival. In contrast with other animal species, whose infants need little or no care, human infants are physically incapable of taking care of themselves.

Anthropology is concerned not only with culture and biology, but also with their interaction. Just as humans are not solely cultural or solely biological, we are not simply the sum of these two, either. Humans are

biocultural organisms, which means that our culture and biology influence each other. The **biocultural approach** to studying human beings is the main theme of this book, and you will examine many examples of biocultural interaction.

The biocultural perspective of anthropology points to one of the unique strengths of anthropology as a science: it is **holistic,** meaning that it takes into consideration all aspects of human existence. Population growth provides an example. Where the sociologist may be concerned with effects of population growth on social structure and the psychologist may be concerned with effects of population growth on psychological stress, the anthropologist is interested potentially in all aspects of population growth. In a given study, this analysis may include the relationship among diet, fertility, religion, disease, social systems, nutrition, and political systems, to name but a few factors.

biocultural approach Studying humans in terms of the interaction between biology and culture in evolutionary adaptation.

holistic Integrating all aspects of existence in understanding human variation and evolution.

variation The differences that exist between individuals or populations.

comparative approach Comparing human populations to determine common and unique behaviors or biological traits.

evolution Change in populations of organisms from one generation to the next.

adaptation The process of successful interaction between a population and an environment.

Variation

A major characteristic of anthropology is its concern with **variation.** In a general sense, variation refers to differences among individuals or populations. The anthropologist is interested in differences and similarities among human groups, in terms of both biology and culture. Anthropologists use the **comparative approach** to attempt to generalize about those aspects of human behavior and biology that are similar in all populations and those that are unique to specific environments and cultures. How do groups of people differ from one another? *Why* do they differ? These are questions about variation, and they apply equally to cultural and biological traits (Figure 1.2).

Evolution

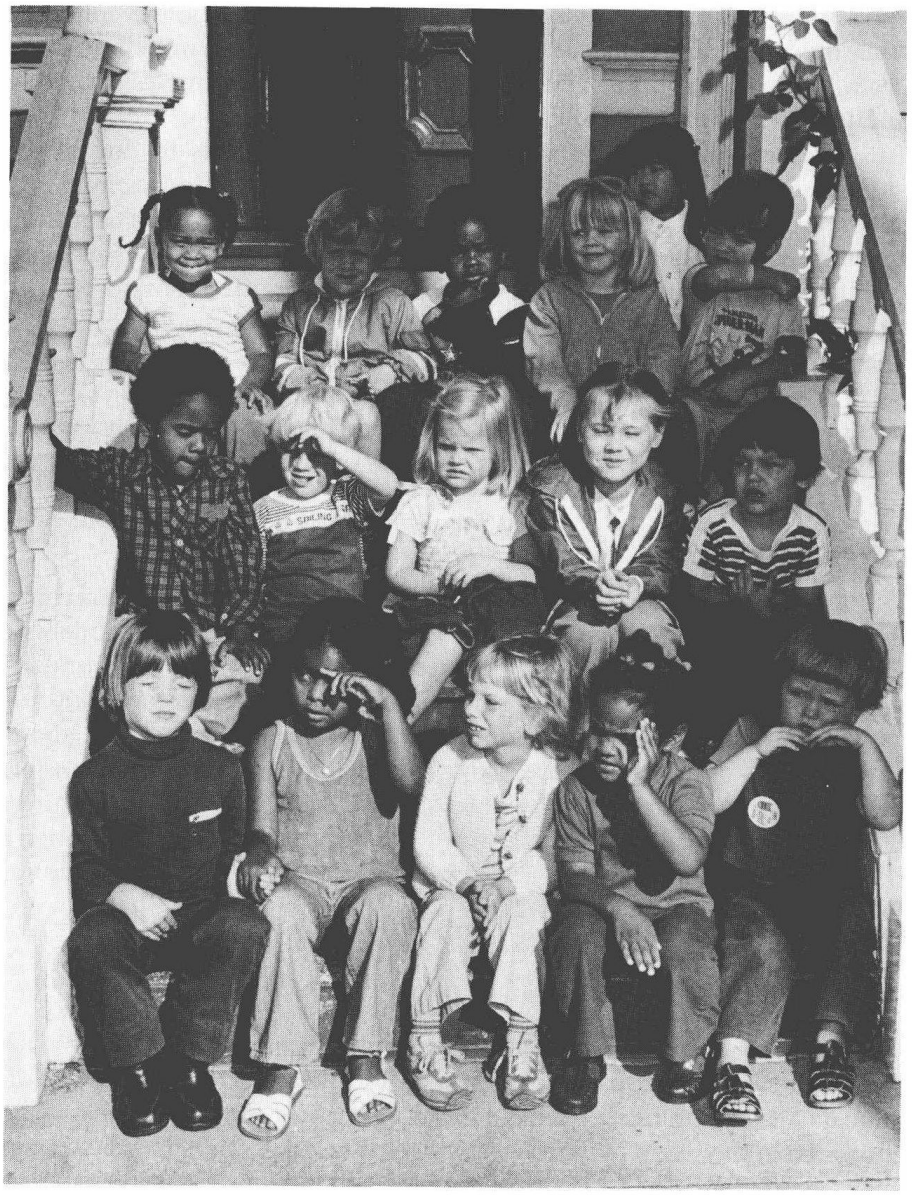
Evolution is change in living organisms over generations. Both cultural and biological evolution interest anthropologists. How and why do human culture and biology change? For example, anthropologists may be interested in the origin of marriage systems. When, how, and why did certain marriage systems evolve? For that matter, when did the custom of marriage first originate, and why? Another example is skin color. An anthropologist would be interested in what skin color the first humans may have had, and where, when, how, and why other skin colors may have evolved.

Adaptation

In addition to the concepts of variation and evolution, the anthropologist is interested in the process of **adaptation.** At the broadest level, adaptations are advantageous changes. Any aspect of biology or behavior that confers some advantage on an individual or population can be considered an adaptation. Cultural adaptations include technological devices

Figure 1.2

Biological variation in a group of children. (© Peter Menzel/Stock Boston)



such as clothing, shelter, and methods of food production. Such technologies can improve the well-being of humans. Cultural adaptations also include social systems and rules for behaviors. For example, the belief in certain societies that sexual relations with a woman must be avoided for some time after she gives birth can be adaptive in the sense that these behaviors influence the rate of population growth.

Adaptations can also be biological. Some biological adaptations are physiological in nature and involve metabolic changes. For example, when you are too hot, you will sweat. Sweating is a short-term physiological