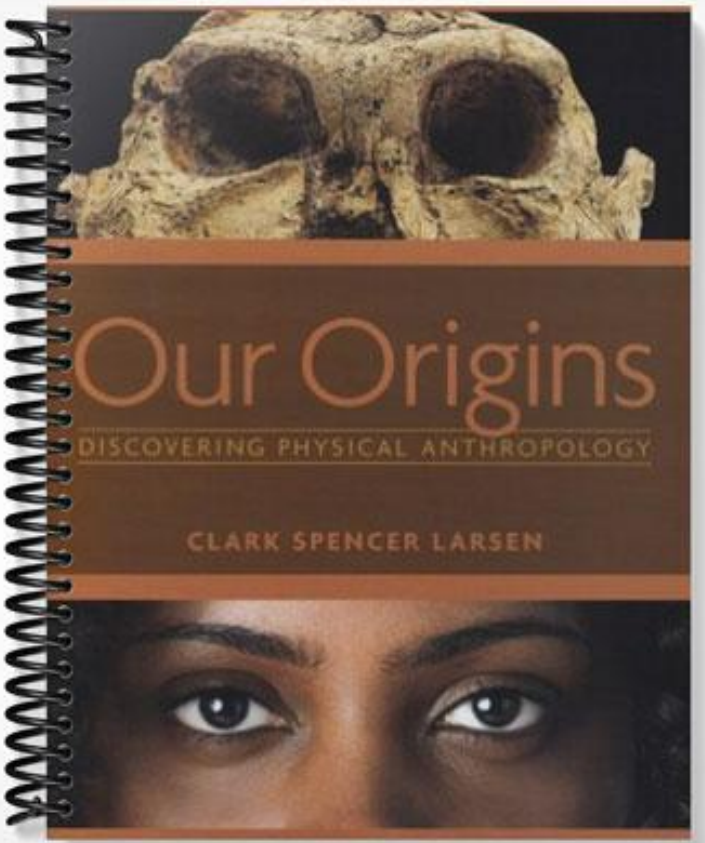
SOLUTIONS MANUAL



Our Origins

DISCOVERING PHYSICAL ANTHROPOLOGY

CLARK SPENCER LARSEN

INSTRUCTOR'S MANUAL and TEST BANK

Our Origins

Discovering Physical Anthropology

INSTRUCTOR'S MANUAL and TEST BANK

Clark Spencer Larsen's

Our Origins

Discovering Physical Anthropology

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W • W • NORTON & COMPANY • NEW YORK • LONDON

Printed in the United States of America

Composition and layout by Roberta Flechner Graphics
Manufacturing by Victor Graphics
Production manager: Chris Granville

ISBN: 978-0-393-93180-8

W. W. Norton & Company, Inc., 500 Fifth Avenue, New York, NY 10110
http://web.wwnorton.com

W. W. Norton & Company Ltd., Castle House, 75/76 Wells Street, London W1T 3QT

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INSTRUCTOR'S MANUAL

Our Origins

Discovering Physical Anthropology

CHAPTER 1 What Is Physical Anthropology?

CHAPTER SUMMARY

Focus of the book:

What humans were in the past
Who humans are today
Where the human species may go in the future
Why humans are what they are as biological organisms

Anthropology is the scientific study of humankind. There are four subfields of anthropology: cultural anthropology, archaeology, linguistic anthropology, and physical (biological) anthropology.

A key concept in the holistic field of anthropology is the *biocultural approach*, or the idea that humans are affected and shaped by both their genetic makeup and the cultural environment that surrounds them.

Physical anthropology is the study of human biological evolution and human biocultural variation. This idea forms the basis for the following two key concepts. First, people at an individual and a species level are the product of a particular *evolutionary history*. This evolutionary history has shaped humans differently from any other species on the planet. Second, each and every person is the product of an individual *life history*. The life history of an individual includes not only that person's genetic makeup but also his or her environment. *Environment* as it is utilized in this textbook signifies not only climate, plant and animal life, and so on but also includes cultural and social factors.

What does it mean to be human? This key concept frames anthropology and drives its investigative questions. Physical anthropology is uniquely situated because it functions not only as a social science but also as a biological science. Physical anthropology is interdisciplinary because it so often borrows from and incorporates other scientific fields. This textbook focuses on six features that

separate humans from all other animals on the planet: bipedalism, presence of a nonhoning canine, dependence on culture, development of hunting, speech, and dependence on domesticated foods.

Anthropology is a *scientific* discipline. Scientists formulate and investigate research questions according to the scientific method. They use observation, documentation and testing to generate hypotheses and to construct theories based on those hypotheses.

CHAPTER OUTLINE

1. What Is Anthropology?
   a. Anthropology is the study of humankind.
      i. Viewed from perspective of all peoples and all times
   b. Four subfields
      i. Cultural anthropology
         (1) Studies present-day people
         (2) Culture defined as transmitted, learned behavior
      ii. Archaeology
         (1) Studies past human societies
         (2) Focuses on material remains and the processes behind them
      iii. Linguistic anthropology
         (1) Studies the construction and use of language by human societies
         (2) Language defined as a set of written or spoken symbols that refer to things
      iv. Physical or biological anthropology
         (1) Studies all aspects of present and past human biology
         (2) Deals with the evolution of and variation among human beings and their relatives
      v. No anthropologist is an expert in all four branches of anthropology.
         (1) All anthropology acknowledges the diversity of humans in all contexts.
         (2) Within the field there is a commitment to the notion that humans are both cultural and biological beings.
      vi. Biocultural approach
         (1) Humans are a result of a combination of inherited (biological) traits and cultural (learned) traits.
      vii. Anthropology focuses on a broad, comparative (holistic) approach.
2. What Is Physical Anthropology?
   a. The study of human biological evolution and human biocultural variation

b. Two key concepts:
   i. Each person is a product of evolutionary history.
      (1) Includes all biological changes that have brought humans to present form
   ii. Each person is a product of an individual life history.
      (1) Combination of genetics and environment (including social and cultural factors)

3. What Do Physical Anthropologists Do?
   a. Physical anthropologists have different research foci.
      i. Study of living people
      ii. Study of other primates
      iii. Study of past people and past societies
      iv. Attempts to answer questions surrounding central tenet: What does it mean to be human?
      v. Application of anthropology to societal issues or concerns
         (1) Forensic anthropology
      vi. Study of all aspects of human biology
      vii. A biological science as well as a cultural science
         (1) Biology is studied within the context of culture and biology.
      viii. Interdisciplinary science
         (1) Utilizes theories and methods from a wide variety of other fields

4. What Is So Different about Humans from Other Animals?: The Six Steps to Humanness
   a. Humans differ from other animals in several important ways.
      i. Bipedalism
         (1) Defined as walking on two feet
      ii. Nonhoning chewing
         (1) Loss of a large canine as the other apes have
      iii. Complex material culture and tool use
         (1) Humans depend completely on culture for day-to-day living and species survival.
         (2) Other apes exhibit some forms of cultural behavior.
      iv. Hunting
         (1) Group pursuit of animals for food
      v. Speech
         (1) The only animal that communicates by talking
      vi. Dependence on domesticated foods
         (1) Development of ability to raise domesticated plants and animals

5. How We Know What We Know: The Scientific Method
   a. Systematic observation of the world
   b. Observations form the basis for the rest of the process.
      i. Identifying problems, developing questions, and gathering evidence (data)
      ii. Data are used to test hypotheses.
         (1) Hypotheses explain, predict, and can be refuted.
   c. This process is called the scientific method.
      i. A way of acquiring knowledge
      ii. Results in an ever-expanding knowledge base
      iii. Empirical, or based on observation
   d. Theory is developed through the process of the scientific method.
      i. Theories are explanations of the way things work.
      ii. Theories can be modified by new evidence.
   e. If a theory proves absolutely true, it becomes scientific law.
      i. Examples: gravity, thermodynamics, and motion

LECTURE IDEAS

What is anthropology? Most, if not all, biological anthropology courses and textbooks begin with this question. Formulating lectures on the subject is easy—most of us can do it in our sleep! The most difficult part of teaching anthropology today is making it relevant for our students. A more important question might be What is anthropology, and how is it relevant to daily life? Looking at the news, especially on-line news sources, can help answer this question. Finding even one topic that you can relate to anthropology and to students' lives can make the difference between a class that is apathetic and one that is involved. Finding examples from students' own lives can be a challenge: Chapter 1 brings up wisdom teeth, with which most people have some experience. Other topics might include nutrition (college students almost always have a wide variety of food practices), health issues such as diabetes, or even how birth order might affect a person's life.

What does it mean to be human? Anthropology is uniquely positioned among all scientific fields to answer this question in the most complete way possible—culturally and biologically. Translating a lecture into a class activity (see below) encourages students to think about humans as animals (some students may have difficulty with this) and therefore subject to the same forces of evolution as all life on the planet. Class activities also allow students to draw from their own experiences and perhaps relate course material to their majors. The idea of what it means to be human can be a running theme through the course and can be reinforced at nearly all stages during the term.

References

anthropology.net/. This website is an online community with the goal of promoting discussion about anthropology and facilitating anthropological research.

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TWO-TO-THREE-MINUTE DISCUSSION TOPICS

1. Define each subfield of anthropology. Give an example of a possible anthropological research topic in that field.
2. How are anthropologists portrayed in the media (movies, TV)? Think *Bones* and *Indiana Jones.* Are these realistic portrayals? Why or why not?
3. How can anthropologists make a difference in people's lives on a global scale? on a national scale? at the local level?
4. How can people apply their knowledge of anthropology in their own lives? For example, how would a pizza-store owner apply her knowledge of anthropology to her business?
5. Group the students in pairs. One student will take five minutes to describe his or her biocultural environment and discuss how it has shaped his or her life history. Students then switch roles.

LONGER DISCUSSION TOPICS

1. Divide the class into small groups. Have each group brainstorm for five or ten minutes on characteristics that humans *share* with other primates. Groups will write down their ideas on a single sheet of paper with all students' names on it. Next, have the students brainstorm for five or ten minutes on characteristics that make humans *unique*, then write those down on the same sheet of paper. (You can use PowerPoint to construct a timer to count down the amount of time left in the discussions.)
2. Have students define biocultural evolution and provide four examples in modern *Homo sapiens sapiens*. What are the implications of biocultural evolution for humans as a species? Can biocultural evolution affect other species on the planet?

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Ferrante, Joan. *Let's Go Anthropology: Travels on the Internet.* Belmont: Wadsworth, 1998.

Omohundro, John T. *Careers in Anthropology.* Mountain View: Mayfield, 2001.

Salzman, Philip Carl, and Patricia C. Rice. *Thinking Anthropologically: A Practical Guide for Students.* Upper Saddle River: Prentice Hall, 2004.

SUGGESTED VIDEOS

Anthropologists at Work: Careers Making a Difference. Anthropologists in different sectors of the workforce. VHS, 1993. 36 minutes. Insight media. 1-800-233-9910.

The Nature of Anthropology. Discusses the goals of anthropology and differences between subfields. VHS, 1983. 30 minutes. Insight media. 1-800-233-9910.

Why Dogs Smile and Chimpanzees Cry. The study of animal emotions. DVD. 1999. 100 minutes. Amazon.com.

SUGGESTIONS FOR FIRST-TIME ADOPTERS

1. Throughout the text, there are examples within the "How Do We Know?" and "Anthropology Matters" boxes. Incorporating these as examples to highlight main lecture points will tie lecture material to the textbook.
2. Thread the theme *What does it mean to be human?* throughout lectures and discussions.
3. The approach of the text is a personal one—anthropology done by real people. Include in your lectures research that you or others in the department have conducted.

CHAPTER 2

Evolution: Constructing a Fundamental Scientific Theory

CHAPTER SUMMARY

Focus of this chapter:

History of the theory of evolution
Darwin's contribution to evolutionary theory
The modern developments in evolutionary theory

Charles Darwin developed the term *natural selection* to describe his hypothesis that biological traits that enhanced an organism's survival in an environment would increase in frequency over time.

Darwin was influenced by ideas and concepts from different fields, including *uniformitarianism*, the idea that the natural processes affecting the earth are the same as in the past.

Evolution by natural selection stands in contrast to Lamarck's idea of *inheritance of acquired characteristics*, which stated that traits gained by organisms during their lives are passed on to their offspring at reproduction.

Modern evolutionary theory combines Darwin's natural selection with three other mechanisms of evolution: *mutation*, *gene flow*, and *genetic drift*. Mutation is the only way new genetic material makes its way into the gene pool. Gene flow refers to the spread of new genetic material from one population to another. Genetic drift is the random change in gene frequency.

Charles Darwin was not aware of the plant experiments conducted by Gregor Mendel, which led to the modern field of genetics. The 1953 description of DNA, the blueprint of life, profoundly affected our understanding of the way the mechanisms of evolution occur.

CHAPTER OUTLINE

1. The Theory of Evolution: The Context for Darwin
   a. Darwin relied heavily on five scientific disciplines of his time.
      i. Geology, paleontology, taxonomy and systematics, demography, and biology
   b. Geology: Reconstructing Earth's Dynamic History
      i. We now know the earth is 4.6 billion years old.
      ii. The surface of the earth has changed significantly over time.
      iii. The great age of the earth was a radical theory in Darwin's time.
      iv. James Hutton was among the first to study natural forces (wind, rain) and calculated Earth's age in the millions of years.
         (1) His idea is called uniformitarianism.
         (2) The idea was rediscovered by Lyell, who also calculated the age of the earth in the millions of years.
   c. Paleontology: Reconstructing the History of Life on Earth
      i. Robert Hooke tested the idea that fossils were the remains of ancient life by studying the microscopic structure of wood.
         (1) Since fossil wood had a structure identical to that of living trees, Hooke concluded fossil wood came from once living trees.
      ii. Georges Cuvier studied fossil anatomy, pioneering the fields of paleontology and comparative anatomy.
         (1) His observations led to catastrophism, or the idea that earthquakes or volcanic eruptions can lead to mass extinctions.
         (2) Cuvier formulated important descriptions of geologic strata.
   d. Taxonomy and Systematics: Classifying Living Organisms and Identifying Their Biological Relationships
      i. Before Darwin, most scientists realized the need for a classification of life forms, or taxonomy.
      ii. Early taxonomy was based on the idea that species did not change and reflected what the taxonomists thought was God's purpose.
      iii. Carl von Linné (Carolus Linnaeus) developed the system of binomial nomenclature used today.
         (1) Each plant and animal had its own genera and species names.
         (2) Linnaeus's book on taxonomy went through many revisions, and with each he added more levels to the system.
   e. Demography: Influences on Population Size and Competition for Limited Resources
      i. Darwin read many works by important authors after he returned to England.

ii. The most important of these authors was Thomas Malthus.
iii. Malthus's *Essay on the Principle of Population* made the case that populations are limited by their food supply.
iv. In the ensuing struggle for food, individuals that successfully compete for food allow survival of their offspring.
v. Darwin applied Malthus's ideas to his own.

f. Evolutionary Biology: Explaining the Transformation of Earlier Life Forms into Later Life Forms
i. By the late 1700s, scientists began to argue for change in biological organisms.
ii. Jean-Baptiste de Monet (Chevalier de Lamarck) speculated that animals change for purposes of self-improvement.
iii. He believed that animals change anatomically in response to new demands or needs and pass those changes on to their offspring.
iv. His idea is called Lamarckian inheritance of acquired characteristics.
v. We now know this idea to be incorrect.

2. The Theory of Evolution: Darwin's Contribution
a. Darwin's main contribution was the synthesis of ideas with personal observations of the natural world.
i. Darwin observed fossils in South America that resembled living creatures.
ii. Darwin drew on Malthus's ideas of reproduction, variation, and population to form his theory of speciation.
iii. Darwin hypothesized that offspring that survive in an environment would possess advantages for acquiring food and that the frequency of the advantage would increase. As environmental conditions changed, offspring without advantages to adapt to the change would die off. Over time, a common ancestor would give rise to related species.
iv. Darwin collected his research in the 1830s and 1840s but did not write his results until 1856.
v. Alfred Russell Wallace contacted Darwin in 1858 with a set of ideas very similar to those Darwin had arrived at; both men independently talked about evolution by natural selection.
vi. Concerned that Wallace would gain the credit for the idea, Darwin rushed into the writing of his book *On the Origin of Species*, which was published in 1859.

b. Since Darwin: Mechanisms of Inheritance, the Evolutionary Synthesis and the Discovery of DNA
i. Mechanisms of Inheritance
(1) After articulation of his theory of natural selection, Darwin turned to the question of how traits are passed from parent to offspring.

(2) He was unaware of the research being conducted by Gregor Mendel in a monastery in the Czech Republic.
(3) Mendel's experiments with pea plants led to the fundamentals of modern genetics.
  (a) In his observation of the plants, Mendel concluded that a discrete physical unit was responsible for transmission of traits (now called a gene).
  (b) Mendel also discovered that the traits in the pea plants did not blend. (Plants were either tall or short.) Alternate forms of a gene are now called alleles.
  (c) Alleles are either dominant or recessive.
  (d) The combination of the genes from each parent determines the trait expressed in the offspring.
(4) In 1908, Thomas Hunt Morgan repeated Mendel's work with fruit flies.
  (a) His team discovered that all genes are on chromosomes and that both genes and chromosomes are transmitted during reproductive cell division.

ii. The Evolutionary Synthesis, the Study of Populations, and the Causes of Evolution
(1) The combination of Darwin's theory of evolution and Mendel's theory of heredity is known as the modern synthesis and includes four causes of evolution.
  (a) Population genetics tries to answer questions about why and how changes in the gene pool occur.
(2) Natural selection acts only on already existing genes.
(3) Mutation introduces new genetic material into the gene pool.
(4) Gene flow refers to the spread of genetic material from one population to another.
(5) Genetic drift is random chance in the frequency of alleles.
(6) The modern synthesis has unified all of biology and its affiliated fields.

iii. DNA: Discovery of the Molecular Basis of Evolution
(1) James Watson and Francis Crick published their discovery of the structure of DNA in 1953.
  (a) Rosalind Franklin used a special technique to image the DNA double helix.
  (b) DNA analysis has provided new insight into biological relationships between organisms and a molecular "clock" to study evolutionary change.
  (c) DNA has also allowed science to study illnesses such as cancer, heart disease, and stroke.

LECTURE IDEAS

Present the history of the theory of evolution as discussed in Chapter 1. Encourage students to imagine that they are living during Darwin's time, with the viewpoints and knowledge of those alive then. Focus the lecture on the changes in scientific knowledge that occurred during Darwin's time to highlight the importance of evolutionary theory. A similar strategy is to ask them about some technological innovations of today and how those have changed the modern world, linking that change to the change brought about by Darwin's theory.

Structure the lecture around the differences between Darwinian evolution and Lamarck's ideas, highlighting the methods and units of changes within each idea. Use the same examples from each person's perspective. For example, explain the polar bear's white coat from both Darwinian (natural selection) and Lamarckian (acquired characteristics) viewpoints.

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Gould, Stephen J. *Full House: The Spread of Excellence from Plato to Darwin*. New York: Three Rivers Press, 1997.

Olsen, Richard G. *Science and Religion, 1450–1900: From Copernicus to Darwin*. Baltimore: Johns Hopkins University Press, 2006.

TWO-TO-THREE-MINUTE DISCUSSION TOPICS

Quick knowledge quiz: After the lecture/discussion, ask the students to take out a piece of paper and answer the following questions. This is a good way to get a feel for how much they have absorbed.

1. Name the person usually considered to have had the most impact on Darwin's theory.
2. Who was Lamarck? How is his theory different than Darwin's?
3. Who was Alfred Russell Wallace?
4. Who was Thomas Malthus? What was his influence on Charles Darwin?

LONGER DISCUSSION TOPICS

1. Why is evolution such a debated topic in the United States? Are there other countries in the world where evolution is equally debated? Where? (Ask the students to research this topic online.)
2. What happens to animals during times of environmental change? Do humans change the environment? If so, do these changes affect species of plants and animals?
3. Speciation is one potential result of evolution by natural selection. Extinction is another. Discuss processes that might lead to extinction of a species.
4. Have the students discuss the following with a partner:
   a. Choose an example of an animal that is well adapted to its environment and explain why. Then choose an animal that would not be well adapted to an environment and explain why.
   b. Ask students to choose one way in which humans adapt to their environment. How long have humans have been making this adaptation? How might such an adaptation have arisen?
5. Evolution is both fact and a theory. Ask students to explain how this is true, using examples.
6. Name two species that produce offspring at very high rates. Why is the world not overrun with these species? Give two examples of natural selection acting on the species named.

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