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Anatomy and Physiology

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PREFACE

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About *Anatomy and Physiology 2e*

Coverage and Scope

The units of *Anatomy and Physiology 2e* adhere to the scope and sequence followed by most two-semester courses. The development choices for this textbook were guided by hundreds of faculty who are deeply involved in teaching this course, as well as instructional designers, academic success experts, and educational researchers who have supported A&P educators and students. These choices led to innovations in art, terminology, career orientation, practical applications, and multimedia-based learning, all with a goal of increasing relevance to students. We strove to make the discipline engaging and relevant to students, so that they can draw from it a working knowledge that will enrich their future studies and support them in their careers.

Unit 1: Levels of Organization

Chapters 1–4 provide students with a basic understanding of human anatomy and physiology, including its language, the levels of organization, and the basics of chemistry and cell biology. These chapters provide a foundation for the further study of the body. They also focus particularly on how the body's regions, important chemicals, and cells maintain homeostasis.

Chapter 1 An Introduction to the Human Body

Chapter 2 The Chemical Level of Organization

Chapter 3 The Cellular Level of Organization

Chapter 4 The Tissue Level of Organization

Unit 2: Support and Movement

In Chapters 5–11, students explore the skin, the largest organ of the body, and examine the body's skeletal and muscular systems, following a traditional sequence of topics. This unit is the first to walk students through specific systems of the body, and as it does so, it maintains a focus on homeostasis as well as those diseases and conditions that can disrupt it.

Chapter 5 The Integumentary System

Chapter 6 Bone and Skeletal Tissue

Chapter 7 The Axial Skeleton

Chapter 8 The Appendicular Skeleton

Chapter 9 Joints

Chapter 10 Muscle Tissue

Chapter 11 The Muscular System

Unit 3: Regulation, Integration, and Control

Chapters 12–17 help students answer questions about

nervous and endocrine system control and regulation. In a break with the traditional sequence of topics, the special senses are integrated into the chapter on the somatic nervous system. The chapter on the neurological examination offers students a unique approach to understanding nervous system function using five simple but powerful diagnostic tests.

Chapter 12 Introduction to the Nervous System
 Chapter 13 The Anatomy of the Nervous System
 Chapter 14 The Somatic Nervous System
 Chapter 15 The Autonomic Nervous System
 Chapter 16 The Neurological Exam
 Chapter 17 The Endocrine System

Unit 4: Fluids and Transport

In Chapters 18–21, students examine the principal means of transport for materials needed to support the human body, regulate its internal environment, and provide protection.

Chapter 18 Blood
 Chapter 19 The Cardiovascular System: The Heart
 Chapter 20 The Cardiovascular System: Blood Vessels and Circulation
 Chapter 21 The Lymphatic System and Immunity

Unit 5: Energy, Maintenance, and Environmental Exchange

In Chapters 22–26, students discover the interaction between body systems and the outside environment for the exchange of materials, the capture of energy, the release of waste, and the overall maintenance of the internal systems that regulate the exchange. The explanations and illustrations are particularly focused on how structure relates to function.

Chapter 22 The Respiratory System
 Chapter 23 The Digestive System
 Chapter 24 Nutrition and Metabolism
 Chapter 25 The Urinary System
 Chapter 26 Fluid, Electrolyte, and Acid–Base Balance

Unit 6: Human Development and the Continuity of Life

The closing chapters examine the male and female reproductive systems, describe the process of human development and the different stages of pregnancy, and end with a review of the mechanisms of inheritance.

Chapter 27 The Reproductive System
 Chapter 28 Development and Genetic Inheritance

Changes to the Second Edition

The **Anatomy and Physiology 2e** revision focuses on inclusive and equitable instruction, scientific accuracy, and enhanced instructor and student support. The improvements have been informed by extensive

feedback from adopting faculty, curricular innovators, and equity experts.

The revision includes the following core changes:

- In explanations of endocrine function, reproduction, development, inheritance, and related topics, the second edition is clearer and more accurate in differentiations related to sex, and eliminates incorrect equivalencies and generalizations regarding sex and gender. OpenStax thanks Sam Long and River Suh, founders of Gender-Inclusive Biology, for their extensive guidance and support
- Many of the illustrations have been improved to be more representative of diverse populations. We have also added photos of many conditions, symptoms, and disorders that present differently depending on skin tone. (Note that many of the illustration changes were made prior to the second edition revision.)
- In discussions and illustrations of genetics and inheritance, the text is clearer in its terminology and explanations related to parenting and parental roles.
- Several research references, data, and terminology have been improved to improve representation and currency.

These improvements are designed to create welcoming and inclusive learning experiences and promote scientifically accurate practices that students will encounter in their studies and careers. The additions and changes were made in a manner designed to enrich and support all users while maintaining the general approach of the text. Because OpenStax and our authors are aware of the difficulties posed by reorganization and renumbering, the extensive text and illustration changes have been implemented within the existing structure and organization of the book. A detailed transition guide will be available within the book's Instructor Resources at OpenStax.org.

Pedagogical Foundation and Features

Anatomy and Physiology 2e is designed to promote scientific literacy. Throughout the text, you will find features that engage the students by taking selected topics a step further.

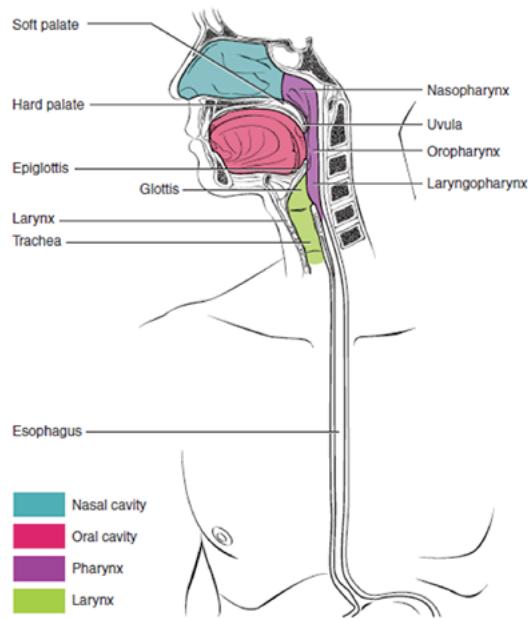
- **Homeostatic Imbalances** discusses the effects and results of imbalances in the body.
- **Disorders** showcases a disorder that is relevant to the body system at hand. This feature may focus on a specific disorder or a set of related disorders.
- **Diseases** showcases a disease that is relevant to the body system at hand.

- **Aging** explores the effect aging has on a body's system and specific disorders that manifest over time.
- **Career Connections** presents information on the various careers often pursued by allied health students, such as medical technician, medical examiner, and neurophysiologist. Students are introduced to the educational requirements for and day-to-day responsibilities in these careers.
- **Everyday Connections** tie anatomical and physiological concepts to emerging issues and discuss these in terms of everyday life. Topics include "Anabolic Steroids" and "The Effect of Second-Hand Tobacco Smoke."
- **Interactive Links** direct students to online exercises, simulations, animations, and videos to add a fuller context to core content and help improve understanding of the material. Many features include links to the University of Michigan's interactive WebScopes, which allow students to zoom in on micrographs in the collection. These resources were vetted by reviewers and other subject matter experts to ensure that they are effective and accurate. We strongly urge students to explore these links, whether viewing a video or inputting data into a simulation, to gain the fullest experience and to learn how to search for information independently.

Dynamic, Learner-Centered Art

Our unique approach to visuals is designed to emphasize only the components most important in any given illustration. The art style is particularly aimed at focusing student learning through a powerful blend of traditional depictions and instructional innovations.

Much of the art in this book consists of black line illustrations. The strongest line is used to highlight the most important structures, and shading is used to show dimension and shape. Color is used sparingly to highlight and clarify the primary anatomical or functional point of the illustration. This technique is intended to draw students' attention to the critical learning point in the illustration, without distraction from excessive gradients, shadows, and highlights. Full color is used when the structure or process requires it (for example, muscle diagrams and cardiovascular system illustrations).

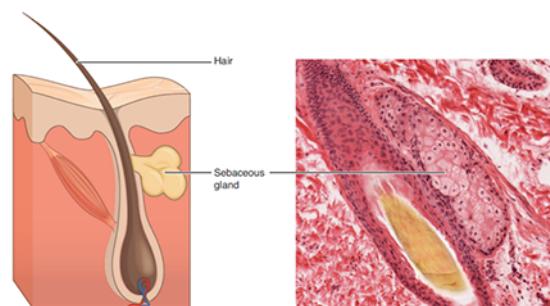


By highlighting the most important portions of the illustration, the artwork helps students focus on the most important points without overwhelming them.

Micrographs

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These glands secrete oils that lubricate and protect the skin. LM \times 400. (Micrograph provided by the Regents of University of Michigan Medical School © 2012)

Additional Resources

Student and Instructor Resources

We've compiled additional resources for both students and instructors, including Getting Started Guides, an instructor solution guide, a curated video guide, and several types of PowerPoint slides and image resources. Instructor resources require a verified instructor account, which you can apply for when you log in or create your account on OpenStax.org. Student resources include guided lecture notes, a student solutions manual, and a pronunciation guide.

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