SIXTH EDITION

Essentials of ANATOMY and PHYSIOLOGY
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To my students, past and present

VCS

To Brooks, for his encouragement

TS
Preface to the Sixth Edition

For twenty years we have had the pleasure and privilege of creating the best textbook we could for introductory courses in anatomy and physiology. The sixth edition of *Essentials of Anatomy and Physiology* continues this tradition, and we at F. A. Davis extend our gratitude to all of you who have made our textbook successful. We also welcome new readers, and thank you for choosing our book.

The sixth edition remains focused on presenting basic anatomy and physiology with the clarity of the text complemented and enhanced by superb illustrations. The text has been updated in many small ways to remain contemporary. These include discussions of apoptosis (programmed cellular death) in Chapter 3 and brown fat in Chapter 4. In Chapter 9, itch has been given full status as a cutaneous sense, and in Chapter 14 self-recognition and self-tolerance have been added to the presentation of immunity.

Illustrations new to this edition include the ATP–ADP cycle in Chapter 2, the neuroglia in Chapter 8, referred pain and optic tracts in Chapter 9, intercalated discs in Chapter 12, development of an allergy in Chapter 14, and aspects of acid–base regulation in Chapter 19. Several illustrations have been revised to include additional helpful detail, including the cell membrane in Chapter 3, a midsagittal section of the skull in Chapter 6, muscle actions in Chapter 7, and spinal cord neurons in Chapter 8. Many of the For Further Thought sections now end with an illustrated question. We hope students will find these enjoyable as well as helpful. Teachers, please keep in mind that the Instructor’s Guide contains a full list of these additions in the “New to This Edition” section for each chapter of the textbook.

As always, your comments and suggestions will be most welcome, and they may be sent to us in care of the publisher: F. A. Davis Company, 1915 Arch Street, Philadelphia, PA 19103.

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To the Instructor

As the science and arts of medicine and health care become increasingly complex, so too does the education of those who pursue careers in nursing and other health-related fields. Human anatomy and physiology is often a first course in many education programs, and is the basis for so many of the more specialized courses. Teachers of introductory anatomy and physiology thus take on a special challenge: We must distill and express the complexities of human structure and function in a simple way, without losing the essence and meaning of the material. That is the goal of this textbook: to make this material readily accessible to students with diverse backgrounds and varying levels of educational preparation.

No prior knowledge of biology or chemistry is assumed, and even the most fundamental terms are defined thoroughly. Essential aspects of anatomy are presented clearly and reinforced with excellent illustrations. Essential aspects of physiology are discussed simply, yet with accuracy and precision. The illustrations complement the text material and foster comprehension on the part of the student. As you will see, these are images in which detail is readily apparent. All important parts have been labeled, but the student is not overwhelmed with unnecessary labels. Illustrations of physiology lead the student step-by-step. Wherever appropriate, the legends refer students to the text for further description or explanation. Each illustration also has a question for the student; the illustration questions in each chapter form an ongoing self-test. (The answers are given in Appendix G.)

The text has three unifying themes: the relationship between physiology and anatomy, the interrelations among the organ systems, and the relationship of each organ system to homeostasis. Although each type of cell, tissue, organ, or organ system is discussed simply and thoroughly in itself, applicable connections are made to other aspects of the body or to the functioning of the body as a whole. Our goal is to provide your students with the essentials of anatomy and physiology, and in doing so, to help give them a solid foundation for their future work, and an appreciation for the incredible living organism that is the human body.

The sequence of chapters is a very traditional one. Cross-references are used to remind students of what they have learned from previous chapters. Nevertheless, the textbook is very flexible, and, following the introductory four chapters, the organ systems may be covered in almost any order, depending on the needs of your course.

Each chapter is organized from the simple to the more complex, with the anatomy followed by the physiology. The Instructor’s Guide presents modifications of the topic sequences that may be used, again depending on the needs of your course. Certain more advanced topics may be omitted from each chapter without losing the meaning or flow of the rest of the material, and these are indicated, for each chapter, in the Instructor’s Guide.

Clinical applications are set apart from the text in boxed inserts. These are often aspects of pathophysiology that are related to the normal anatomy or physiology in
the text discussion. Each box presents one topic and is referenced at the appropriate point in the text. This material is intended to be an integral part of the chapter but is set apart for ease of reference and to enable you to include or omit as many of these topics as you wish. The use of these boxes also enables students to read the text material without interruption and then to focus on specific aspects of pathophysiology. A comprehensive list of the boxes appears inside the book's front and back covers, and another list at the beginning of each chapter cites the boxes within that chapter.

Tables are utilized as summaries of structure and function, to present a sequence of events, or additional material that you may choose to include. Each table is referenced in the text and is intended to facilitate your teaching and to help your students learn.

New terms appear in bold type within the text, and all such terms are fully defined in an extensive glossary, with phonetic pronunciations. Bold type may also be used for emphasis whenever one of these terms is used again in a later chapter.

Each chapter begins with a chapter outline and student objectives to prepare the student for the chapter itself. New terminology and related clinical terms are also listed, with phonetic pronunciations. Each of these terms is fully defined in the glossary, with cross-references back to the chapter in which the term is introduced.

At the end of each chapter are a study outline and review questions. The study outline includes all of the essentials of the chapter in a concise outline form. The review questions may be assigned as homework, or used by the students as a review or self-test. Following each question is a page reference in parentheses. This reference cites the page(s) in the chapter on which the content needed to answer the question correctly can be found. The answers themselves are included in the Instructor’s Guide. The questions in the sections titled For Further Thought may be used in a variety of ways, and the answers are in the Instructor’s Guide.

An important supplementary learning tool for your students is available in the form of a Student Workbook that accompanies this text. For each chapter in the textbook, the workbook offers fill-in and matching-column questions, figure-labeling and figure-coloring exercises, and crossword puzzles based on the chapter’s vocabulary list. Also included are three comprehensive, multiple-choice chapter tests to provide a thorough review. All answers are provided at the end of the workbook.

Ancillary materials for the teacher using this text are all on a CD-ROM: a complete Instructor’s Guide, a test bank using three formats, and an Interactive Teaching Tool presentation of the text illustrations, with related questions for students. The Instructor’s Guide contains notes on each chapter’s organization and content (useful for modifying the book to your specific teaching needs), topics for class discussion, answers to the chapter review questions from the textbook, and detailed answers to the For Further Thought questions.

Suggestions and comments from colleagues are always valuable, and yours would be greatly appreciated. When we took on the task of writing and illustrating this textbook, we wanted to make it the most useful book possible for you and your students. Any suggestions that you can provide to help us achieve that goal are most welcome, and they may be sent to us in care of F. A. Davis Company, 1915 Arch Street, Philadelphia, PA 19103.

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To the Student

This is your textbook for your course in human anatomy and physiology, a subject that is both fascinating and rewarding. That you are taking such a course says something about you. You may simply be curious as to how the human body functions or you may have a personal goal of making a contribution in one of the healthcare professions. Whatever your reason, this textbook will help you to be successful in your anatomy and physiology course.

The material is presented simply and concisely, yet with accuracy and precision. The writing style is informal yet clear and specific; it is intended to promote your comprehension and understanding.

ORGANIZATION OF THE TEXTBOOK

To use this textbook effectively, you should know the purpose of its various parts. Each chapter is organized in the following way:

**Chapter Outline**—This presents the main topics in the chapter, which correspond to the major headings in the text.

**Student Objectives**—These summarize what you should know after reading and studying the chapter. These are not questions to be answered, but are rather, with the chapter outline, a preview of the chapter contents.

**New Terminology and Related Clinical Terminology**—These are some of the new terms you will come across in the chapter. Read through these terms before you read the chapter, but do not attempt to memorize them just yet. When you have finished the chapter, return to the list and see how many terms you can define. Note those you may not be sure of and look them up. All of these terms are fully defined in the glossary.

**Study Outline**—At the end of the chapter, this is a concise summary of the essentials in the chapter. You may find this outline useful as a quick review before an exam.

**Review Questions**—These are also at the end of the chapter. Your instructor may assign them as homework. If not, the questions may be used as a self-test to evaluate your comprehension of the chapter’s content. The page number(s) in parentheses following each question refers you to the page(s) in the chapter on which the content needed to answer the question can be found.

**For Further Thought**—The heading tells you what these questions are for: thinking. Your instructor may use these for class discussion, and, if so, please do not ever be afraid to be wrong. Contribute, raise your hand and speak up with your best thoughts, and listen to those of others. Together you will find the answers.
OTHER FEATURES WITHIN EACH CHAPTER

Illustrations—These are an essential part of this textbook. They are intended to help you develop your own mental picture of the body and its parts and processes. You may not have thought of mental pictures as being important, but they are, and each new one you create is a major step in learning. Each illustration is referenced in the text, so you will know when to consult it. With a little concentration, you will have it in your mind for whenever you need it. You will see that each illustration has a question after the legend. These questions provide an ongoing quiz; try to answer each one as you come to it. The answers are given in Appendix G, just before the glossary.

Boxes—Discussions of clinical applications are in separate boxes in the text so that you may find them easily. Your instructor may include all or some of these as required reading. These boxes are an introduction to pathophysiology.

Bold Type—This is used whenever a new term is introduced, or when an old term is especially important. The terms in bold type are fully defined in the glossary, which includes phonetic pronunciations.

Tables—This format is used to present material in a very concise form. Some tables are summaries of text material and are very useful for a quick review. Other tables present additional material that complements the text material.

Glossary—Found at the end of the book, the glossary is your dictionary. All of the terms in bold type in the text, as well as others, are defined here. Make use of it, rather than wonder what a word means. The sooner you have a definition firmly in your mind, the sooner it is truly part of your knowledge.

To make the best use of your study time, a Student Workbook is available that will help you to focus your attention on the essentials in each chapter. Also included are comprehensive chapter tests to help you determine which topics you have learned thoroughly and which you may have to review. You will find it very helpful.

SOME FINAL WORDS OF ENCOURAGEMENT

Your success in this course depends to a great extent on you. Try to set aside study time for yourself every day; a little time each day is usually much more productive than trying to cram at the last minute.

Ask questions of yourself as you are studying. What kinds of questions? The simplest ones. If you are studying a part of the body such as an organ, ask yourself: What is its name? Where is it? What is it made of? What does it do? That is: name, location, structure, and function. These are the essentials. If you are studying a process, ask yourself: What is happening here? What is its purpose? That is: What is going on? And what good is it? Again, these are the essentials.

We hope this textbook will contribute to your success in this course and in your education.

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